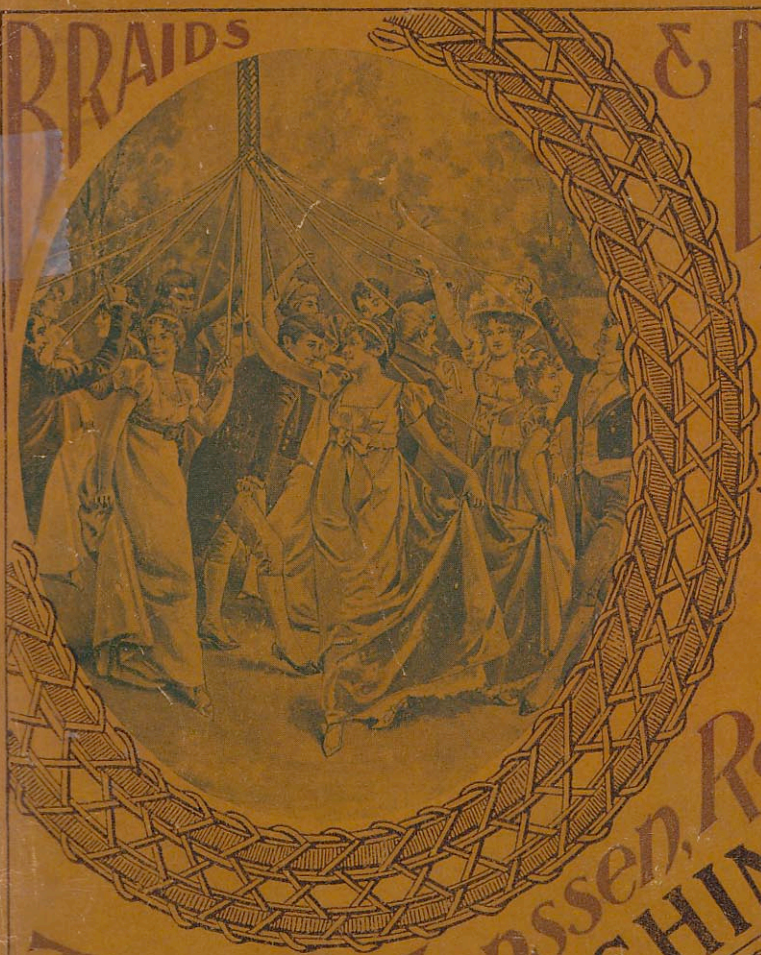
BRAIDS & BRAIDING



Textile Machine Works,

Reading, Pa.

Thun & Janssen, MACHINERY.

Special Machines for Braid, Trimming and Electrical Wire Manufacturers.

BRAIDING

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ENGINEERS,
6, BROWN STREET,
MANCHESTER.
TELEPHONE No. 1364.

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NOTE.

We herewith present to our friends and patrons a treatise on the art of braiding, together with a number of illustrations drawn by us to show some of the designs that can be produced on our machines.

For the cuts of the diagrams we are indebted to a German technical publication, "*Handbuch der Weberei*," by Reiser & Spennrath.

The machines shown in this catalogue are all of our own design, and represent only a small number of the different machines produced by us. We have endeavored to show at least *one machine* of each type.

Our system of construction has the advantage of great elasticity, and we can, with our present line of patterns or with slight additions thereto, meet any demands that can come up in our line of work.

Any additional information and prices will be cheerfully given by correspondence.

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Introduction

The art of braiding in its most primitive form dates back to the very dawn of civilization. It is as old as the art of weaving, and very likely preceded it.

Primeval man, after shaping a piece of flint into an axe (first weapon and first tool), starts to conquer the brute forces of nature. Formerly their subject, he now becomes their master. He destroys what is in the way of, and creates what is helpful to, his comfort.

Sample of pre-historic braiding.

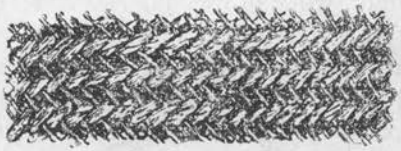


Fig. 1.

Twigs cut from the trees of the forest are entwined into mats used in the crudest form of human habitation for protection against the elements, and in this operation is found the germ of braiding, twisting, spinning and weaving. Simple textures and basket work of pliable twigs and fibres are the first works of the textile art.

In Africa, which is in so many respects a wonderland, showing almost all the early stages of advancing civilization, some tribes were found by travelers to live in huts formed by entwining and braiding together the branches and twigs of trees, and articles from the crudest mat made from twigs and roots up to the often quite beautiful articles braided or plaited by hand out of bast and fibres are found among the natives to-day.

Sample of pre-historic braided mat.

Fig. 2.

Great skill is displayed in these objects in producing figures and fancy effects.

It is noteworthy that in Africa and other uncivilized countries are found products of human labor which are braided or plaited by hand by people who have not yet learned the art of weaving. This would tend to show that weaving is a later art than braiding, which is explained by the fact that the loom had to be invented before weaving could be done.

The oldest known form of hand braiding is probably the braid from a woman's hair, but apart from this the art of braiding by hand has without doubt been carried on by most tribes and peoples. The natives of our own continent were very skilled in the art, as is proven by braided articles found in pre-historic graves of America, as illustrated by Fig. 1 and Fig. 2.

The development of the human race is repeated in every individual through all its stages and when one of the greatest educators, Frœbel, pointed out the most natural and philosophical method of teaching children to work through constructive play in the kindergarten, it was not by accident that he adopted the braiding of small articles from strips of paper or straw as one of the earliest tasks for the child's creative faculty.

The distinctive difference between braiding and weaving lies in the fact that in braiding *one series* of threads are crossed lengthwise, passing alternately over and under each other, making a texture of warp threads only, while in weaving *two series* of threads are used, of which one, the filling, traverses the other, the warp threads, at right angles. Of the two processes weaving is by far the most important, as there is almost no limit to width and design of a fabric, and for that reason the loom and product of the loom have been constantly improved since the beginning of civilization, and especially since the beginning of the machinery era, which dates from the invention of the spinning machine.

Many narrow fabrics used for tying or ornamentation, however, could not be woven on a loom, and for these the process of braiding was used long before the braiding machine was invented.

In the middle ages the dames and maidens of Europe welcomed Spring by dancing around the May pole with their male companions, carrying colored ribbons in their hands which they wound around the pole in the same manner in which a round braid or cord is made.

They also knew how to turn and twist silken threads to make a braid for use as an ornament on a lady's garment or a soldier's armor, or for the girth of his battle sword. In every museum many beautiful pieces of hand braiding can be seen.

It was not until the middle of the last century that the *braiding machine* was invented.

The first official mention of a machine for making braids is an English patent of the year 1748, to Thomas Walford in Manchester; but at the same period, the middle of the last century, the industry of making braids was already firmly established in Barmen, Germany, which may truly be called the birthplace of the braid industry. Braids were manufactured there in large quantities long before the introduction of steam power, and to this day that city has held a firm hold on the industry, sending braids to all parts of the world. We estimate the number of machines running there at 100,000.

The great development of the braid industry in the United States in the last twenty years has caused us to engage in the manufacture of braiding machines, and, owing to the superiority of American machine tools and to our complete equipment, which includes many special machines of our own design, combined with close application and concentrated effort, we are now able to turn out a thousand machines per year,

and have established for our product a reputation as *the best*, which is evidenced by the fact of our sending them to Europe in considerable quantities.

In the following pages we offer to our friends and patrons a short treatise on braids and braiding, on the different machines of our construction, their purpose, advantages of construction, their application in various branches of industry, their possibilities and limitations.

The evolution of every industry has been going on rapidly; the industries in which braiding machines are employed are no exception. We believe in this evolution and are content as well as determined to be a factor in it.

Specialization has been the secret of the industrial development, the fruits of which are now enjoyed. We are specialists in braiding machinery and accessories and strive to find our best happiness in our best work.

Our firm has been established since July, 1892. We brought a thorough knowledge of the braid business as well as of the machinist's trade into the concern, which was started in a small way, and our past success has proved that we had the correct principle as a foundation.

If the contents of this little book win us your confidence in our ability to help you in extending your business by supplying you with any of the machines we offer, write us. We place our experience and facilities at your command. If you have any special wants or ideas in our line to work out, let us know and we will be glad if we can be of service to you. We have a shop covering 15,000 square feet of floor space, filled with modern machinery. We employ about 70 machinists skilled in our particular work. We have draftsmen and patternmakers constantly at work on new machines and designs. The elements of our machines are always carried in stock by us, such as gears of all sizes, carriers for every conceivable purpose, etc., and our system enables us to build any special machines cheaply and promptly.

A Braid

is formed by crossing diagonally and lengthwise several strands in such a way that each of them lies alternately over and under one or several of the others. This means that at least *three* strands are required to form a braid; two could only be *twisted* around each other. The material used is of great variety, according to the purpose the braid is to serve. Straw, hair, bast, wire, cane, etc., are used; in most cases, however, threads of cotton, wool, worsted, mohair, silk, linen, flax and hemp, jute and metal threads or tinsel. The braids may be divided into four classes, according to the manner in which the threads are united.

Plain Flat Braid.

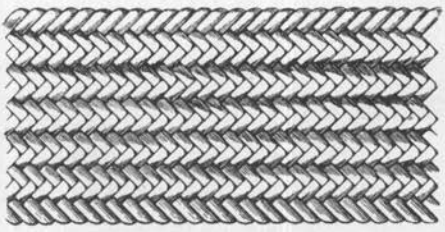


Fig. 304.

1. Flat Braids.
2. Tubular Braids and Cords.
3. Stripe Braids.
4. Lace Braids.

Flat Braids consist of a number of threads laid in zigzag shape, and each thread crosses every one of the others, lying alternately over and under them. See Fig. 304.

Cord, Plain Pattern.

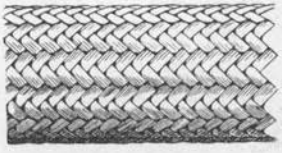


Fig. 315.

Cords and Tubular Braids are formed by uniting an even number of threads, one-half of which run from right to left, the other from left to right; the threads of the same group do not cross *each other* but cross alternately over and under the threads of *the other group*. See Fig. 315.

3 Row Fancy Stripe Braid.

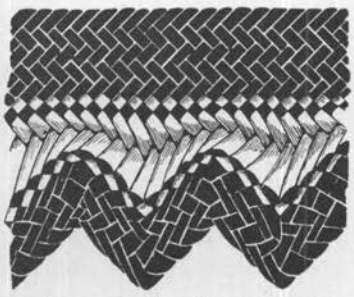


Fig. 328.

Stripe or Alliance Braids are formed by joining together two or more flat braids in such a manner that the threads of each two adjoining braids are braided together with or twisted around each other; each section can be of a different color or material from the rest. See Fig. 328.

Lace Braids consist of several braids running parallel to each other, in which two adjoining sections exchange threads at intervals, leaving holes between these intervals which produce the lace effect. See Fig. 334.

The mechanical production of braids takes place in the following manner: The threads are wound on bobbins, either singly or in pairs. All the threads are carried to the centre of the machine where the braid is formed in the braid former. The bobbins are arranged in two series, one of which runs from right to left, the other from left to right, each moving in a serpentine course and crossing each other at the points of intersection. The threads of one series are alternately laid over and under those of the other series moving in the opposite direction, while the braid thus formed is continuously drawn off by a take-up mechanism.

36 Carrier Lace Braid.

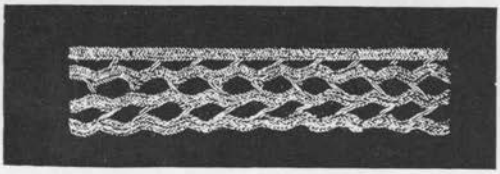


Fig. 334.

To describe the manner in which this movement of the spools is accomplished leads us to a description of the construction of our machines.

The principal parts of all braiding machines are the two plates. On our machines the plates are made from rolled steel and are generally $\frac{11}{32}$-inch thick; for heavy work we increase the thickness. These two plates are connected by means of stay bolts, and the distance from the top to the bottom plate is about 4 inches. The bottom plate is the bed-plate of the whole machine and carries the *gear bolts* or axles on which the *horn gears* revolve. We punch square holes into the bottom plates and the gear axles, which are *turned from solid steel*, have accurately milled square shoulders at both ends fitting in these square holes.

The horn gears are double flanged gear wheels, carrying notches or horns in the upper flange, and their object is to give to the spools the zigzag semi-annular movement before mentioned. Horn gears are made with 2, 3, 4, 5, etc., notches and are termed accordingly as two, three, four or five horn gears.

On the top plate of the machine guide grooves are provided, which correspond nearly with the pitch line of the gears. The small inside plates or quoits have square holes in the centre and rest on a square shoulder of the gear bolts. In the guide grooves the *bobbin carriers* move. They are provided with a driver or pin below the top plate, which engages the horns or notches of the gears below. By means of this pin and the horn gears the carrier is moved through the guide grooves, remaining in the horn of one gear until the point of crossing is reached,

where it is transmitted to the next gear and carried along to the next crossing. At least two gears are required to produce a braid.

The most important part of all braiding machines is the carrier or spindle, and since the earliest days of the manufacture of braiding machines numerous patents have been taken out in this and other countries for alleged improvements on these parts. Four things are required of the carrier :

First—To carry the bobbin on which the thread is wound.

Second—To provide for the thread a tension as regular as possible.

Third—To let off the thread evenly ; and

Fourth—To stop the machine when a thread breaks or a spool becomes empty.

Horizontal Bobbin Carrier, Patented January 31, 1899.

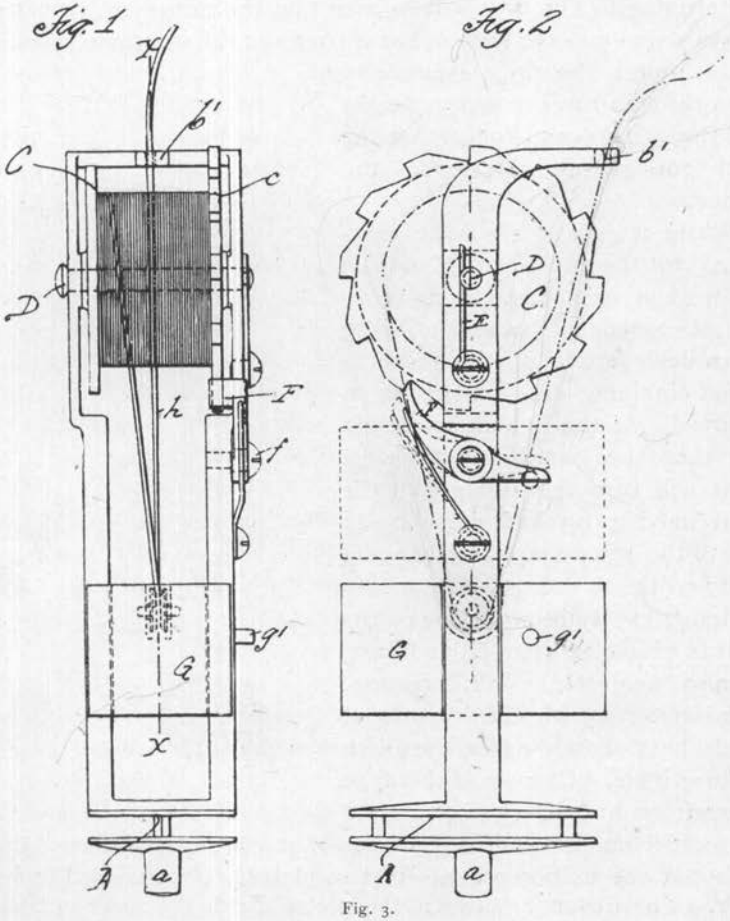


Fig. 3.

Carriers are made on which the bobbin is held in a horizontal position, but for obvious reasons the available room cannot be utilized to the full advantage, and this construction is therefore only used for special purposes, where a kink of the material must be avoided or other conditions necessitate this construction. A carrier of this construction is shown in Fig. 3, and has been patented by us under date of January 31, 1899.

The bobbin carriers with vertical bobbins may be divided into two classes, the first having the tension weights inside and the second outside of the bobbins. The carrier which has the tension weight inside of the square pipe on which the bobbin rests is the one used principally in Europe, and it has numerous advantages which have led us to adopt the same and to recommend it wherever fine work is to be done.

Referring to Fig. 4, it will be seen that the thread is drawn through the eyes *p* and *q* in the stem of the carrier and the stopper *n* respectively, thence through the china eyes *r* and *s*, then through the eye of the weight *k* and the china eye *t*, from which the thread goes to the former of the machine.

Square Pipe Carrier.

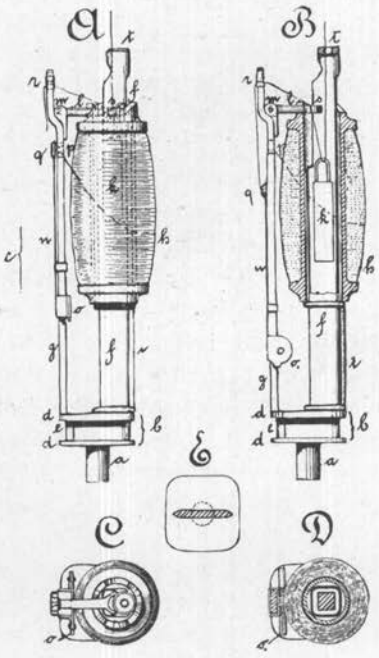


Fig. 4.

While it is a trifle more complicated to thread a carrier of this kind, we can recommend it as being the most economical, both for utilizing the available space of the machine and for obtaining an even tension on the thread. If the bobbin is a little wider than the diameter of the steel pipe it will turn very easily, and the weight moving up and down freely inside of the square pipe and hanging directly on the thread, produces a very even tension. By being inside of the pipe it is protected from oil and dust, and also against the air pressure, which interferes with the dropping of weights on fast running carriers with outside weights. Carriers of this type are carefully brazed together out of parts formed on the punching machine, and are very light and durable. The foot of the carrier consists of two plates, *d d*, connected by a heart piece *e*. The distance between the plates *d d* is the same as the thick-

ness of the top plate of the machines, and the feet of the carriers are finished accurately on automatic machines which we constructed for that purpose. These machines mill the feet to the proper width and also finish the heart pieces, including the beveled points. When a thread breaks or a spool runs out, the stopper *n* drops down and strikes with its wing *o* against a lever arranged on the top plate near the carrier curves. This lever is connected either with the driving pulley or with the clutch gear used for transmitting the motion to the machine, and as soon as it is moved out of position by the action of the stopper striking against it, the machine comes to a standstill instantly. With large machines several of these levers are provided and connected. See Fig. 5.

37 Carrier Machine, showing arrangement of Centre Gear and Stop Motion.

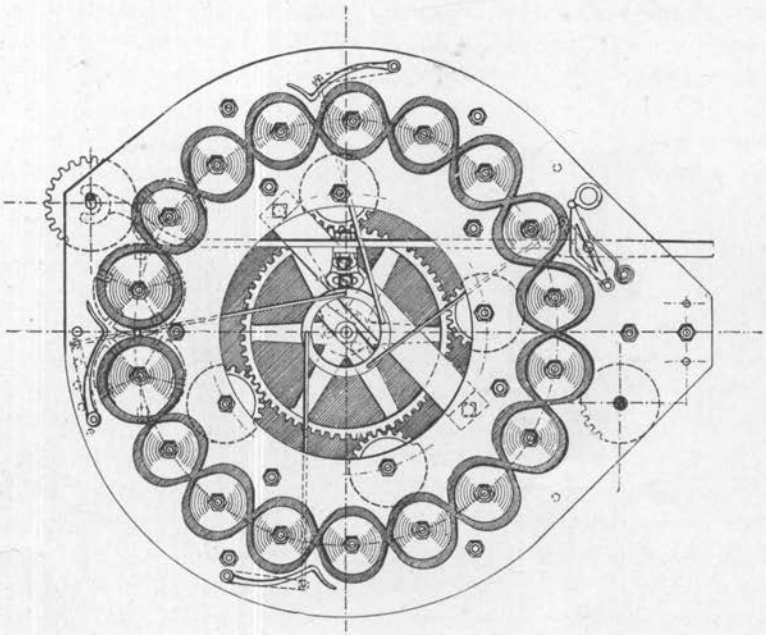


Fig. 5.

For ordinary cotton braids or insulated wire braiding machines, we recommend the use of our carriers with outside weights, as shown on Fig. 6.

This carrier was also patented by us and shows some excellent features, being at the same time simple and convenient. As will be seen by referring to the cut, the bobbin is put on or taken off by depressing the spring and tilting the bobbin slightly. When in position the bobbin

revolves around the centres a^3 and b, resting on the spring G, the length of which is so adjusted that it does not exert any pressure upon the bobbin, and the latter therefore runs with a minimum of friction. The weight D slides up and down on the standard B, and by lifting the top weight E releases the ratchet and allows the thread to unwind. The china eye c in the swinging arm C acts as a thread guide. By swinging the spring C in the position shown in Fig. 3, both the top and bottom weights can be readily removed from the carrier for the purpose of cleaning the same or changing the weights.

Improved Carrier, with Outside Weights. Patented.

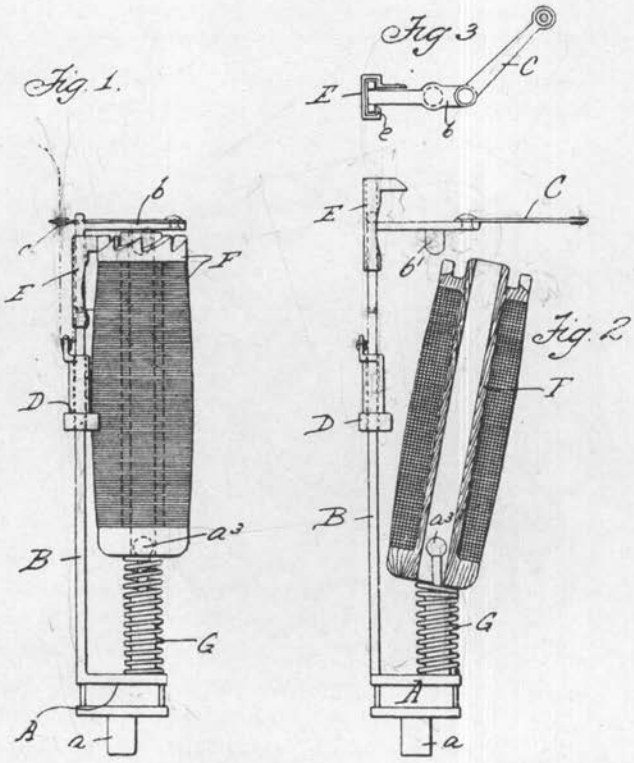


Fig. 6.

During the short time this carrier has been on the market it has met with universal favor, and is without any doubt the most simple and practical of any similar devices known to the trade. It allows of using a very large bobbin, and does away with the possibility of lifting the bobbin or throwing off the top weights.

Another important element of the braiding machine is the take-off mechanism. As we said before, the braid is almost always taken off automatically and for this purpose we generally employ a roller stand with three rollers, of which the upper one is rigidly held in its bearings, while the bearings of the lower two yield and can be regulated with a spring tension according to the thickness of the braid that is to be made on the machine. Change gears with different numbers of teeth allow of a quick change of the speed at which the braid is drawn out of the machine. Our roller stands are so constructed that when a change gear of 19 teeth is on the worm gear shaft, the number of teeth on the lower or driving gear corresponds with the number of plaits per inch to the braid that it is desired to obtain. The worm gear which drives the roller stand is cut on a special gear cutter and has 56 teeth. The worm is cut on the lathe from the solid metal and engages accurately with the teeth of the worm gear. Both worm and worm gear are used either in right or left thread according to the direction of the movement of the gear from which motion is transmitted to the roller stand.

Cans, generally 36 inches high and 10 inches in diameter, are stood in front of these roller stands, into which the finished braids are delivered.

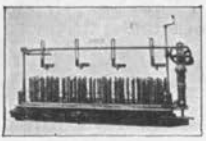
For round cords or electric wires and packing a single take-up wheel of large diameter is used, and the goods are wound on reels or drums generally operated by being belted direct to the braiding machines.

On some types of round braiders used for covering wooden or metal moulds, olives, etc., a hand take-off is still used, because the irregular shape of the moulds does not readily allow of mechanical contrivances for disposing of the finished product.

The speed of braiding machines, while it varies naturally according to the material that is being worked and the braid that is to be produced, may be as high as the material on the machine will allow of without breaking. Generally the best results are obtained by running the machines at a speed of 160 to 185 revolutions of the handle per minute. This means that 320 to 370 carriers pass a given spot of the circumference of the machine every minute, or, in other words, 320 to 370 picks are made. To find the theoretical production of one of our machines on a given braid, the above number should be divided by the number of picks per inch, which will give the number of inches the machine will produce per minute. Supposing a braid has twenty picks to the inch, and is made of a strong material allowing of a speed of 180 revolutions per minute, the production will be $\frac{360}{20}=18$ inches per minute, or 300 yards per day. Under favorable conditions, 90% of this theoretical production can easily be attained in ten hours.

TANDEM MACHINES.

Small braiders, such as soutache machines, 9, 13, 17, 21, 25, 29 and 33 carrier flat braid machines, etc., are generally built with 2, 3, 4 or more machines (heads) on one plate. The advantage in this is principally the saving of space, as a very compact plant can be obtained in this way, and in many cases two to three times as many machines can be placed on a given floor space than would be possible where each machine is run singly. A saving in price is also effected by this arrangement, since for the two, three or more machines coupled in this manner only one driving, take-off and stopping mechanism is required.



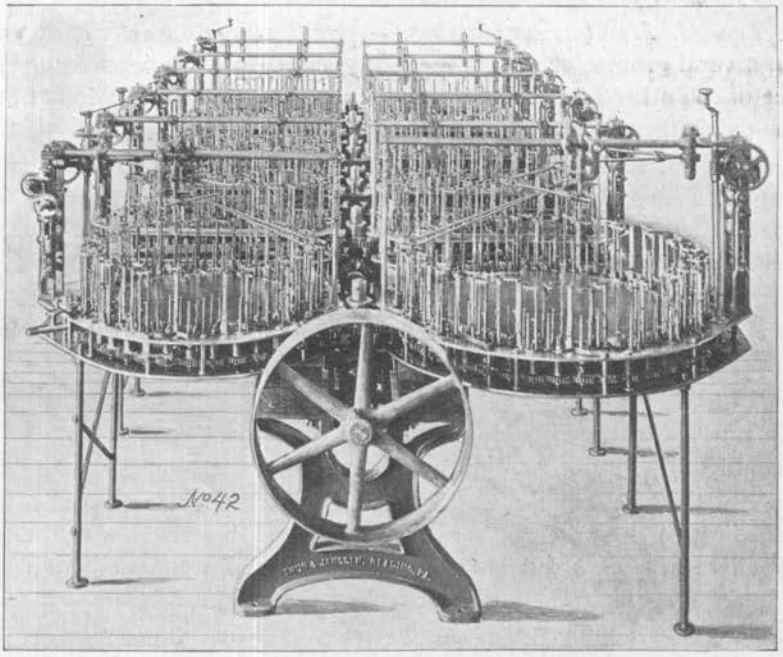
The apparent disadvantage resulting from the fact that the stopping of one head necessitates the stopping of the others also, is in actual practice generally outweighed by the advantage of having the machines closer together, as the operator does not need to walk as far for a given number of machines.

For special requirements, or wherever it is preferred, we furnish single head machines with pulley-drive.

DRIVING TABLES.

For making braids in quantities we recommend the driving of the machines by gearing as shown in cut No. 42. We furnish iron driving tables for this purpose, the construction of which is shown on page 44. These tables have heavy cast iron legs planed out to receive wrought iron channels. Heavy planks are bolted down on these legs the entire length of the table and on these planks the rear ends of the machines are fastened by means of an anchor bolt screwed into the wood. A shaft of 1½ inches diameter provided with a key-way over its entire length runs between the channels. From this shaft the power to run the machines is obtained at any place on the table by means of a pair of bevel gears and boxes, serving at the same time as bearings for the shaft and supports for the vertical bolts on which the driving gears revolve. One set of driving gears is used to run two machines, one at each side of the table. According to the width of the machines, a greater or smaller number are placed on one table and the length of the tables is determined by the space available or the character of the work. The spur gears on the driving sets are made in different sizes, with 30, 35, 40, 45 and 50 teeth, according to the speed at which it is desired to run the machines. The

shaft is generally run at a speed of 75 revolutions per minute. These spur gears engage clutch gears used for driving the machines. The clutch gears have heavy teeth and revolve on the bushing of an end gear of a finer pitch engaging with the horn gears and provided with notches, so that by the raising of the starting lever in the front of the machines



the clutch gear is pressed down into the notches of the end gear and the machine started. These clutch gears are readily interchangeable, *to change the speed of the machine*, and we furnish them with different numbers of teeth from 14 to 26.

For heavy machines, especially those for technical purposes, the belt drive is to be preferred, even for a large plant.

Having described the essential parts common to all braiding machines, we will now distinguish the different types.

The character of the different braids is governed by the manner in which the horn gears are arranged, by the number of horns or notches, and by the distribution of the carriers on the available notches.

Referring to the division of braids into four classes mentioned on page 7, we have to distinguish between four types of machines.

Type I. Machines for making Flat Braids. All carriers move in one closed raceway or track, following and crossing each other.

Type II. Machines for making Tubular Braids or Cords. The carriers form several groups, each of which has a separate track, crossing with those of the other groups. The carriers of the same group do not braid with each other.

Type III. Machines for making Stripe Braids. The carriers are grouped on several closed raceways, each group moving in the manner of Type I, all the carriers of one group crossing all the carriers of the adjoining group.

Type IV. Machines for making Lace Braids. The carriers are arranged in groups moving in the manner of Type I, and the adjoining groups exchange carriers at regular or irregular intervals.

With all types of braiders the number of horns or notches in the gears must be at least double the number of carriers, as each carrier must meet an empty horn in passing from one gear to the other.

Type I. Machines for making Flat Braids. The machines of this class consist of a number of horn gears arranged in a circle. In the raceway above the horn gears each carrier is carried from one horn gear to the other in semi-circles until it arrives on the end gear. On this it makes a full revolution and returns again to the last point of intersection, moving now in the opposite direction, being carried back to the starting point. With each new horn gear the carrier crosses its former course and the thread carried by it is laid alternately over and under those of the carriers moving in the opposite direction. Between each two carriers there must be an empty horn, as otherwise the carriers would collide. At each point of intersection a carrier meets an empty horn on the next gear which enables it to move in between two carriers running in the opposite direction. It follows from this that the end gears must have an uneven, and the middle gears an even number of horns (a number divisible by 2). For if the end gears would have an even number of horns, the carriers would, in returning to the last crossed point, meet with the carrier that was two or four or six horns behind them and therefore they could not pass. With end gears having an odd number of horns, each carrier is put back for the space of one horn in the rotation and therefore always meets an empty horn at the points of intersection. For the same reason

the middle gears must all have an even number of horns, as otherwise the rotation would be disturbed and the carriers would collide.

In order to give to the braid a full even edge, the end gears always have more horns than the middle gears. Generally the end gears are made with five horns and the middle gears with four. This arrangement produces what is called the plain braid.

If the middle gears have six and the end gears have seven horns, each thread passes alternately under and over *three* opposite threads and the braid resulting in this manner is called a *Hercules braid.* See Fig. 13.

If the middle gears have two and the end gears three horns, the thread passes only under and over *one* of the opposite threads, and this manner of braiding is called diamond or basket pattern. Generally, instead of using two-horn middle and three-horn end gears, gears with four and six horns respectively are employed and the carriers are put on the machine in pairs, always two following each other without any empty horns between them. See Fig. 14.

In order to get a braid of a regular appearance each thread should alternately lie over and under an equal number of crossing threads, which will always be the case if the middle gears have all the same number of horns and the total number of gears is an even one.

The smallest number of gears that can be used on a braiding machine is *two*, in which case the end gears only are used and the middle gears are left out altogether. These gears must always have an uneven number of horns, and the braids produced on machines of this class are made with an uneven number of threads, 3, 5, 7, 9, 11, 13, etc. Braids of this character are called soutaches, which originally is a Hungarian name. It is the simplest braid that can be made.

Diagram of 13 Carrier Soutache Braid.

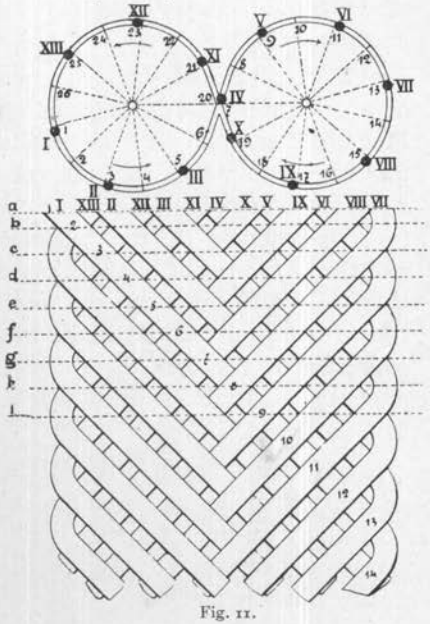


Fig. 11.

The diagram shown in Fig. 11 indicates the manner in which a 13 carrier soutache braid is formed. The carriers are indicated by black dots and numbered in rotation with the numbers I to XIII. The dotted lines radiating from the centre of the two horn gears indicate the horns, and are marked with figures 1 to 26.

The lines *a*, *b*, *c*, etc., each indicate the position of the threads which they occupy when the carriers have moved the distance of one horn in the direction of the arrow. The positions of the carrier I from 1 to 14 correspond, therefore, with the lay of the thread I in the positions 1 to 14. As will be seen, each thread lies alternately under and over six of those moving in opposite directions.

The axles on which the horn gears revolve are hollow, and warp threads are introduced through these hollow axles, which give to the two halves of the soutache braid a raised or rounded appearance.

Diagram of 2-line Flat Braid (plain).

Fig. 12.

Soutache braids are used very largely for passementeries and dress trimmings, made from mohair, gold or silver tinsel for military trimmings on uniforms; made from white cotton they are used as candlewicks.

In southern countries soutache braids made from jute yarn are largely used for making sandals. Extra heavy machines of this kind are also used for making braids from coir or cocoanut fibre, which are afterwards sewed together for matting.

In Fig. 12 is shown a diagram of a 9 Carrier Flat Plain Braiding Machine, and it will be easily understood in which way the construction of the braid results from the construction of the machine and the arrangement of the carriers thereon. As it will be seen, each thread passes alternately under and over *two* of the opposite threads, and the resulting braid shows two complete double ribs or lines and is, therefore, generally called a two-line plain flat braid.

Diagram No. 13 shows a 13 carrier Hercules braid. It will be noticed here that each thread passes alternately under and over *three* of the others, and the resulting braid is called a two-line Hercules braid. In a Hercules braid warp threads are generally introduced through the hollow bolts, the same as described with the soutache machines.

In diagram No. 14 is shown the construction of a two-line flat diamond braid. Ten carriers are used for producing this braid, and they are arranged in five groups of two each, indicated by the numbers I to V. Each pair of threads is treated as one, and it will be seen how they braid only under and over *one* of the threads or pairs of threads moving in the opposite direction, thereby forming what is called the diamond or basket pattern.

Diagram of 2-line (13 Carrier) Hercules Braid.

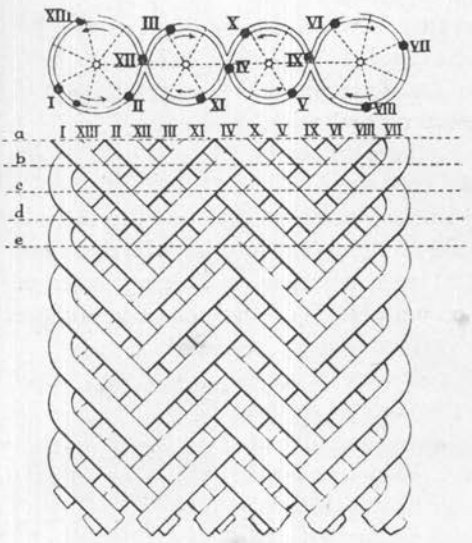


Fig. 13.

Diagram of 2-line Diamond Braid.

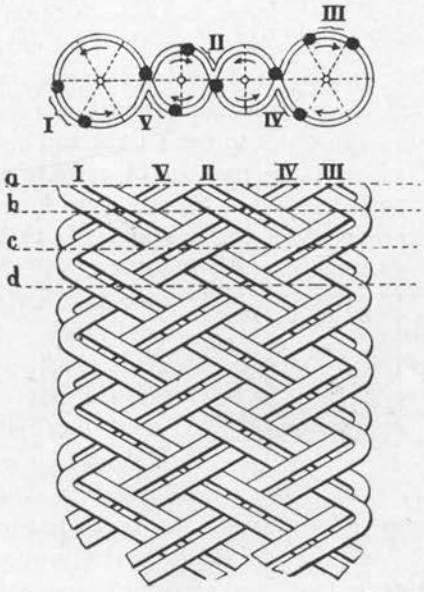


Fig. 14.

In most braid factories diamond braids are produced on the same machines as the plain braids, which can be done if the machines are provided with an extra set of end gears and a suitable change piece in the top plate. In this way the five-horn gears can be replaced by six-horn gears, and the machine changed from plain to diamond. See Fig. 34, on page 36.

In the diagrams shown on the preceding pages the horn gears are arranged in a straight line for the purpose of projection. As a matter of fact, all machines having four or more gears are built with the gears arranged in a circle, as the distance from the carriers to the point where the braid is formed must not vary too much. If arranged in a straight line the distance, and therefore the length of the thread, would vary considerably, and in order to give the weight sufficient drop and to keep

the thread under tension, the carriers would have to be extremely long. To avoid this the gears are arranged in the periphery of a circle, in the centre of which is the braid former. In this way the difference in the lengths of the thread is reduced to a minimum, being a little less than the diameter of the horn gears.

Fig. 15 shows a 13 carrier flat braid machine in which the threads running from the carriers to the braid former are indicated by dotted lines.

Diagram of 3-line (13 Carrier) Flat Braid Machine.

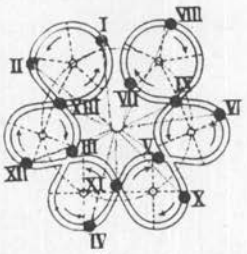
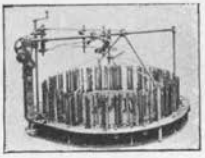
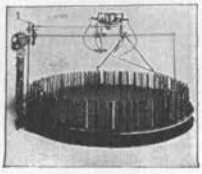


Fig. 15.

With large machines we sometimes provide a cut-off to a lower number, for instance, from 65 to 61, which is done in a similar manner in which a machine is changed from plain to diamond.

In order to get a tight and even braid machines with a large number of carriers are provided with beaters. These beaters consist of combs with steel prongs swinging in and out in the level of the braid former. The points of these prongs beat the threads into the braid and facilitate the forming of a tight and even fabric. On large machines a different form of beaters, called crown beaters or umbrella beaters, are often used, which consist of a number of pointed wire prongs arranged in a ring or disc in the centre of the machine and made to swing radially in the direction of the braid former. They are used mostly for braids having many warp or filling threads, as on machines of large diameter the tension of the weight is often not sufficient to produce a very tight braid.





On all machines on which warp threads are to be used the gear bolts are bored and warp guides are provided and fastened on the threaded end of the bolt the height of the carriers. The warp spools are arranged in suitable frames or holders below the machines.

Besides the straight and plain braids a great many fancy braids are produced on flat braid machines. Rickracks, wave braids and other fancy patterns can be made by using tension weights of different sizes. Frequently these wave braids are produced with loops or eyes either on one or two sides by means of special loop attachments, shown on page 43. These loop attachments are operated by the carriers themselves and serve to raise or lower alternately a wire or wires in such a way that part of the threads will go over the wire and thereby form the loops. By means of this attachment very beautiful designs can be produced, and braids of this character have been very popular trimmings for some years.

By letting some of the carriers run empty or taking them off the machine altogether, and the proper use of warp threads, braids with holes or *open work* braids are made. They are used very extensively for making hat forms when made out of glazed cotton in imitation of straw, so called Belgrade braids.

Another method of producing fancy effects on flat braiding machines is the introduction of bise or gimp as warp ends. The purl-edge Hercules braid, shown in one of our illustrations, is made in this manner and is quite a staple article in the trade. It is necessary to use a gimp of the proper twist and softness to get a good effect and for a purl-edge braid with a purl on both sides right and left twist gimps must be used. The twisting action of the threads under tension winding themselves around the gimp causes the latter to lay around the edge in a spiral. On large machines a nice even purl edge is difficult to obtain and for this purpose we make hollow copper needles, through which the bise is drawn and which serve as selvedge bars at the same time.

A great many fancy effects are obtained by the combined application of the open work principle and of bise or gimp warp threads of a contrasting color or material.

The tension weights, warp threads and loop attachments are the three most important factors in producing fancy effects in braids made on plain machines, and there is almost no limit to the variety of patterns that can be obtained through these.

Flat braids in various forms are used for trimming ladies' dresses, for skirt braids, shoe laces, underwear braids, tapes for tying purposes, elastic braids with rubber filling, for millinery trimmings and for making entire hat frames, as bindings for binding men's coats, blankets, etc., or for embroidering and a great many other purposes.

We illustrate a number of plain and fancy designs belonging to this class.

Plain Soutache.

Fig. 300.

Diamond Soutache Braid.

Fig. 301.

Plaited 3 Carrier Soutache.

Fig. 302.

Fancy Plaited Soutache (3 Triple Carriers.)

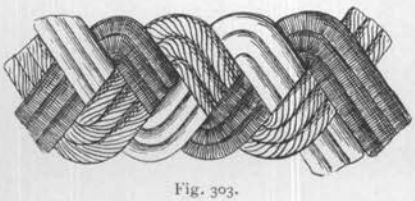


Fig. 303.

Flat Braid with 1 Purl Edge.

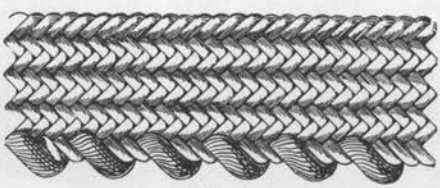


Fig. 306.

Diamond Flat Braid.

Fig. 305.

Wave Braid.

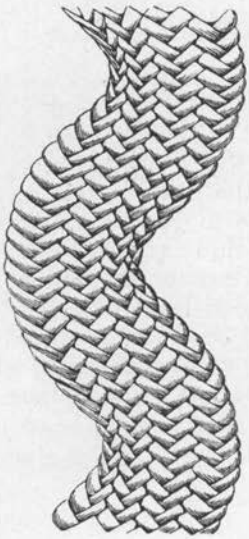


Fig. 307.

Loop Edge Wave Braid.

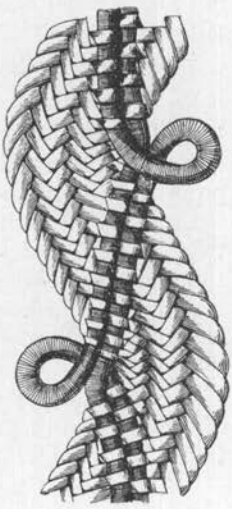


Fig. 308.

Rickrack Braid.

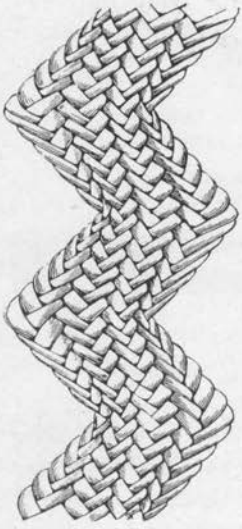


Fig. 309.

Loop Edge Rickrack Braid.

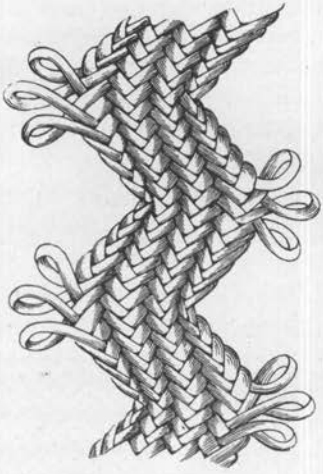


Fig. 310.

Hercules Braid, 4-line.

Fig. 311.

Fancy Soutache Hercules Braid.

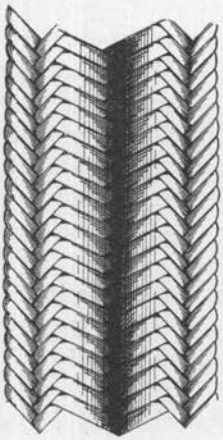


Fig. 312.

Fancy 4-line Hercules Braid with 2 Purl Edges.

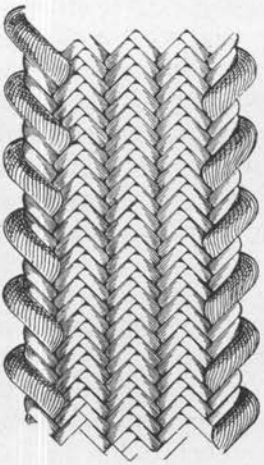


Fig. 313.

Open work Flat Braid.

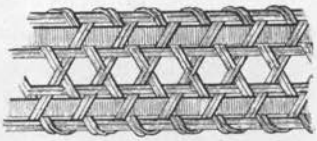


Fig. 314.

President Braid.

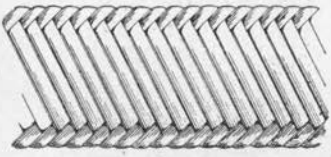


Fig. 325.

Purl Edge President Braid.

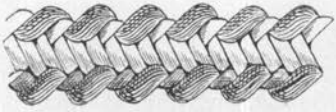


Fig. 326.

Fancy President Braid.

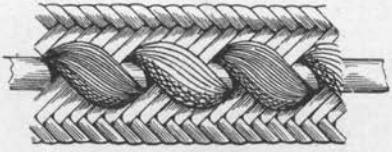


Fig. 327.

Type II. The Machines for making Cords and Tubular Braid consist of several complete carrier courses crossing each other. The carriers of one group do not braid with each other but only with those of the other group or groups and move simultaneously with those around a common centre of rotation.

The carriers are so arranged in the different courses that they do not collide with the other course in crossing. For this reason there is always an empty horn between each two carriers into which the carrier of the other course can enter at the points of intersection. If there are more than two courses on a round braider there must be two or three empty horns between each two carriers.

Most of the cord machines have two courses, but some machines with three or four courses are made, on which braids known as *coral braids* are produced.

On ordinary cord machines the gears generally have four horns and the carrier courses are so arranged that the same number of carriers are used on the inner and outer course. Ordinarily all the gears have an equal number of horns and the total number of all gears must always be divisible by two. The smallest machine possible of this class would have four gears of two horns each and four carriers. Round braiding machines are arranged the same as the flat braiding machines for producing the *diamond, plain* or *Hercules* pattern. On round braiders with four horn gears the plain or diamond pattern can be produced at will by simply changing the position of the carriers, without the necessity of any changing of the gears.

In Fig. 18 a twelve carrier round braider is shown, and in the lower part of it the product of this machine. The carriers of one course are indicated by dots and the numbers I to VI. They run from right to left. The carriers of the other course are characterized by rings and the figures VII to XII. They move from left to right. From the position of the threads in Fig. 18 we see that each thread of one course binds twice with each thread of the other course during one revolution, viz., once in front and once on the reverse side of the cord. Thread *a*, for instance, crosses with thread *b* at *c* and *d*; while at *e* the threads again assume the same position as at *c*.

Diagram of 12 Carrier Round Machine.

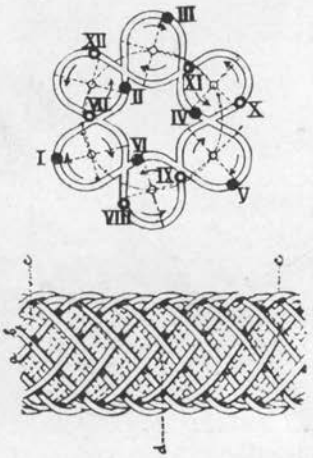


Fig. 18.

For the same reasons as explained with the flat braid machines, the round machines are built with the centres of the gears in a circle. They differ from the flat machines only inasmuch as they have no end plates and no end gears with an *uneven number* of horns. The appearance of a cord is influenced largely by the number of horn gears, especially where a coarse material is used. A cord made on a machine with four gears is, therefore, almost square in cross section; with six, eight, etc., gears, it takes a hexagonal, octagonal, etc., shape, and the larger the number of gears is the more it approaches a perfect circle. Practically, however, a cord made on a 12 or 16 carrier machine is round, but a cord made on an 8 or 12 carrier square machine is generally of square shape, especially where warp threads have been introduced into the braid. Braids of this character are, therefore, called square cords, and they form a trimming largely used on uniforms and for military effects.

If a soft, pliable thread is used on a round braiding machine, the resulting fabric will conform itself to the shape of any core that may be introduced through the centre of the machine. Such cores are frequently used, but are mostly round.

Tubular braids have the appearance of two flat braids joined at the edges, of which one lies under the other one, and they are used very largely as dress trimmings and shoe laces.

A great many braids made on round braiders are used for making passementerie trimmings, sometimes tubular, sometimes round, and often provided with loops. Moulds, beads and tassels used by the passementerie trade are also made on these machines, inasmuch as they consist of wooden forms braided over with silk or mohair threads on round braiders. Braiders for making these moulds generally have no automatic take-off, as it requires one operator for each machine to fill in the blanks.

Spindle banding, corset laces and picture cords are among the products of round braiders and quite extensively used. Whip handles are also braided over on machines of this construction.

Among this group of braiding machines we must also mention the machinery for technical purposes, for making packing, and for insulating electric wires or covering rubber hose. The principles upon which these machines are based are the same in every respect as on the previously mentioned machines. They differ only in the heavier construction and special take-off arrangements calculated for the heavy duty they have to perform.

Packing Braiders are made with 8 carriers for making square flax packing, and with 16, 24, 32, 36, 40, 48, 56, 64 or 72 carriers for making round packing out of cotton, jute, hemp or asbestos. After these packings have been braided, they are generally treated and boiled with lubricants and frequently a rubber core is used to make the packing more elastic.

Special machines of this class are built with funnel-shaped fillers for filling the inside of a hollow tube with cork, asbestos or fossil earth, and the product of these machines is used for *covering steam pipes*, etc.

For *covering insulated wires and cables* we have constructed a number of carefully built machines with large take-up gears, arranged above the centre of the machine in such a way that the speed at which the wire is fed through the machine can be regulated by simply changing the gears on the side of the standard. This large take-up wheel runs loose on the shaft and is driven from the circumference by means of a pinion, which makes the machines very stiff and capable of hand ling heavy work.

Machines are also made which form a combination of Types No. I and No. II, and are called *Cord Edge Braid Machines*. These machines

Cord Edge Braid.

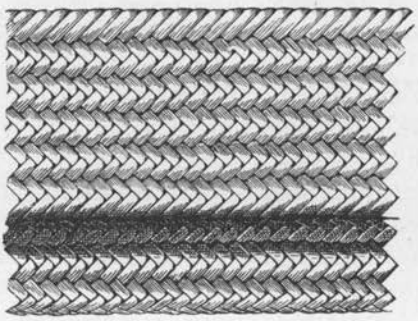


Fig. 330.

Brush Braid made on Cord Edge Machine.

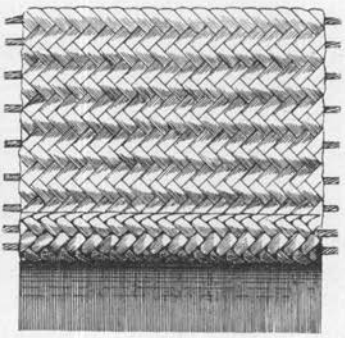


Fig. 331.

are so arranged that the course of the carriers producing flat braid traverses the course of the carriers forming the cord at one point in such a way that the threads of both sections are firmly interbraided. The product of these machines is used quite extensively for binding the edges of garments, such as overcoats, jackets and skirts. Quite recently we have provided these cord-edge machines with a scissor attachment, which cuts half of the threads forming the cord, and thereby forms what is called a brush-edge braid. These scissors are operated by means of an eccentric on the worm shaft, and are so placed that they cut the loops in the centre. This brush-edge braid has come into very general use as a skirt binding and possesses excellent wearing qualities, which would seem to warrant a long continuance of its popularity.

Among this group we must also class the 14 carrier square and the coral braid machines, which are used quite extensively for making narrow trimmings. We show the products of both of these machines among the illustrations.

Loop Edge Cord.

Fig. 319.

16 Carrier Square Cord.

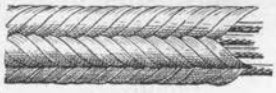


Fig. 320.

Feather Edge Braid made on 14 Carrier Square Machine.

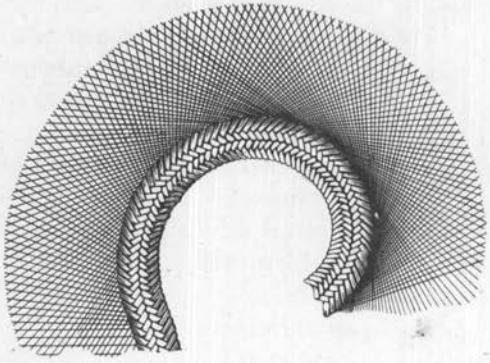


Fig. 322.

Cord Diamond Pattern.

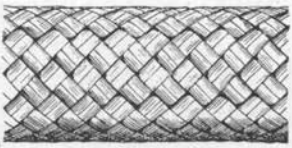


Fig. 316.

Tubular Braid, Plain Pattern.

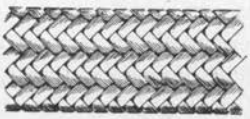


Fig. 317.

Tubular Braid, Diamond Pattern.

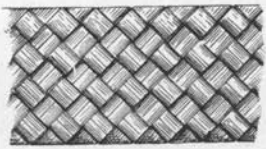


Fig. 318.

Fancy 14 Carrier Square Braid.

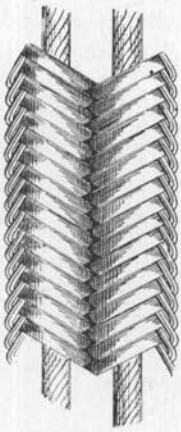


Fig. 321.

Loop Braid
made on 14 Carrier Square Machine.

Fig. 323.

Fancy Coral Braid.

Fig. 324.

Type III. Machines for making Stripe Braids. The principle upon which these machines are made consists in the joining together of two or more sections of flat braids by letting all the carriers of two adjoining sections twist around each other on a plate of such construction that each carrier coming from the right will be returned in the same direction after crossing one or two of the carriers coming from the opposite direction. In order to effect an easy running of these machines it is necessary to employ supplementary horn gears and, to give the plates the shape as shown in our engravings. We illustrate several bed-plates of these stripe braiders, and can make, in addition to those shown, an almost

Lace-edge Braid
made on Stripe Braiding Machine.

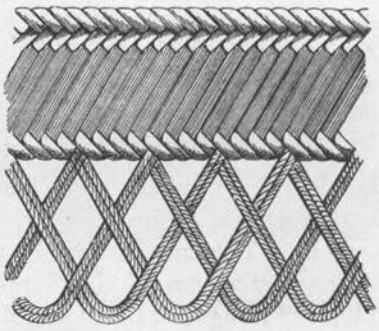


Fig. 329.

unlimited number of combinations by grouping the gears and carriers in different ways, according to the pattern it is desired to produce. Stripe braids with three sections are mostly made, as they allow of producing patterns with two borders and a different colored centre. We illustrate several braids made on machines of this kind.

Type IV. Lace Braiding Machines. These machines consist of several courses, which are so constructed that the carriers of two adjoining courses can pass from one to the other. This braiding from one course to the other, however, does not occur continually, as with the stripe braid, but only at intervals, which can be regulated according to the pattern to be produced. For this purpose switches are provided between the sections. In Fig. 20 two of these switches are shown at *A*

Diagram of 2-thread Lace.

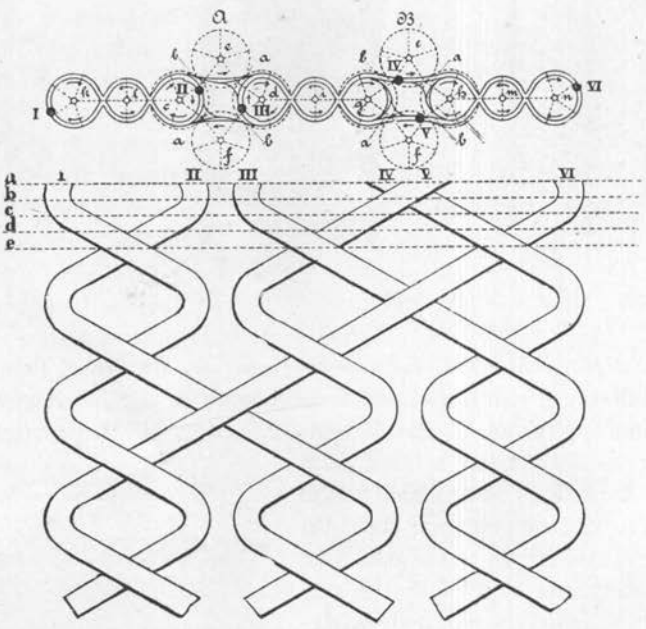


Fig. 20.

and *B*. They consist of two loose tongues *a*, and two movable tongues *b*. In this diagram *c*, *d*, *g*, *h*, are the end gears of two adjoining sections. The crossing over of the carriers from one section to the other is done by means of the supplementary gears *e*, *f*. If the movable tongues *b* lie against the plates of the gears *g* and *h* (see at *B*), the carriers will pass from one section to the other. Two carriers always cross at the

Diagram of 3-thread Lace.

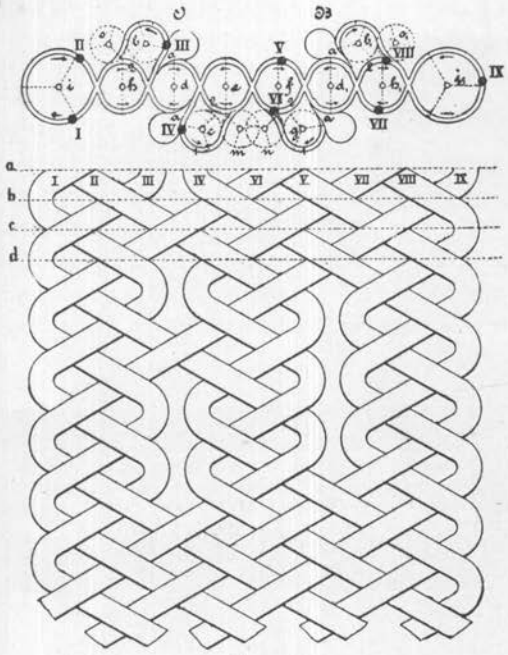


Fig. 21.

same time, so that two adjoining sections exchange carriers. This is necessary in order to retain the original number of carriers in each section and to obtain a regular braid. A different arrangement of switches is shown in Fig. 21, which shows a more compact form of arranging the gears of lace machines.

In the simplest types of lace machines the opening and closing of the switches is done by the carriers themselves. Part of the carriers on these machines are provided with collars, which turn the switches by means of short levers placed on the ends of the shafts of the movable switches and against which these collars strike, thereby opening and closing the switches.

Referring to Fig. 20, it will be seen that if one of these carriers is moving towards the end gear at the position of number IV it will strike against the finger and close switch *b*, so that the following carrier, instead of passing over from one section to the other, will remain on the gear *g*. If the next carrier is provided with a collar it will again change the position of the switch, and the one following it will take the same course as its predecessor, but if the second carrier has no collar the switch will remain in its position until a carrier with a collar changes it. In this manner lace braids on the order of Figs. 332 to 335 are formed. The individual strands of this braid are generally made in the shape of rickrack or wave braids by using tension weights of different sizes, and very often the one border is ornamented with loops by using a loop attachment of the usual construction. Generally the

27 Carrier Lace Braid.

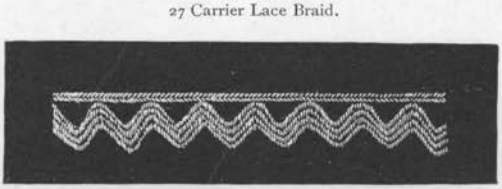


Fig. 332.

36 Carrier Lace Braid.

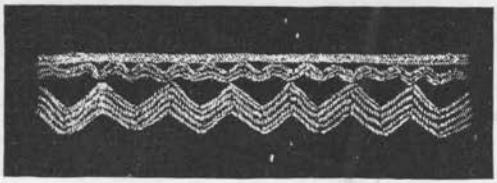


Fig. 333.

weights are placed in such a way that the heaviest of the weights are on one of the end gears of the section, while the light weights are on the opposite gear, and on the adjoining section they are placed in the same manner. The result of this is that the different wave braids are joined at the points and openings are formed, as is shown in Figs. 332 to 335. The border of braids of this kind is generally made straight, as this produces the nicest braids and facilitates the sewing on. Lace braids of this kind are generally made with nine carriers to each section and the total number of carriers on the machine is therefore generally a multiple of $9 = 18$, 27, 36, 45, 54, and 63.

36 Carrier Lace Braid with Loop Edge.

Fig. 335.

This arrangement of producing lace braids by means of switches operated by the carriers themselves, while allowing of a great many variations, limits the possibilities of the machine to producing short patterns. A further development is a machine provided with pattern discs revolving by being connected with the gearing of the machine and having notches at intervals corresponding with the distances of the carriers on the machine, and fingers fastened on these discs for the purpose of operating the switch mechanism.

The latest machines of this kind are provided with a jacquard mechanism, which works on the same principle as a jacquard loom.

2-thread Lace.

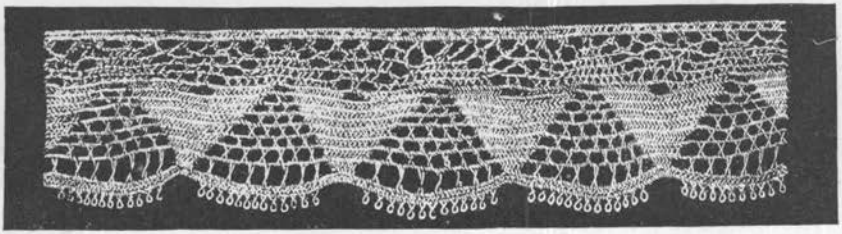


Fig. 336.

Paste board cards are strung together to an endless chain, and the braiding of the lace is determined by the number and position of holes punched into these cards. Laces, as shown in Figs. 336, 337 and 338, are made in

3-thread Lace.

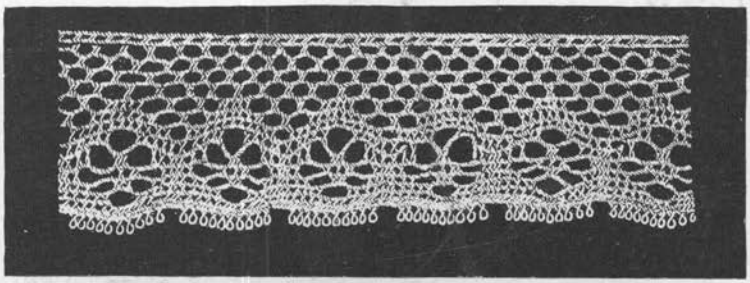


Fig. 337.

2-thread Lace.

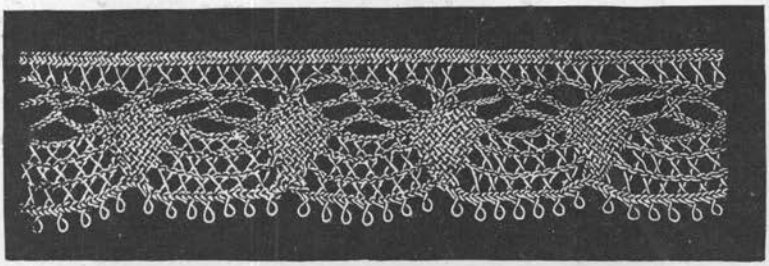


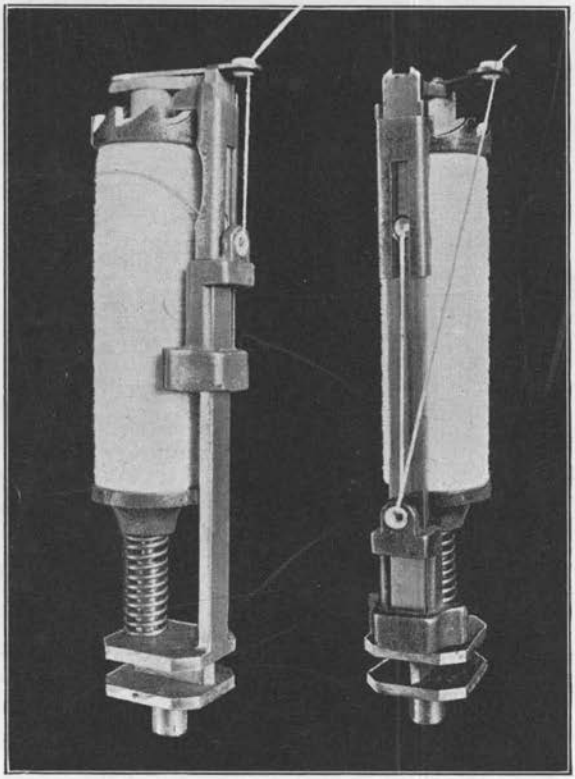
Fig. 338.

this manner, and in Europe they are producing laces to-day up to ten and twelve inches in width and of very complicated patterns. Lace machines of this kind have not as yet been introduced to any extent in the United States, but with a further development of the industry they will undoubtedly find a wide field of usefulness. We are equipped and ready to furnish machinery of this class.

Laces of this most improved kind are made in linen, silk, mercerized cotton, mohair and tinsel, and are used for trimming underwear and also as dress and millinery trimmings.

Improved Carrier.

Patented January 31, 1899.

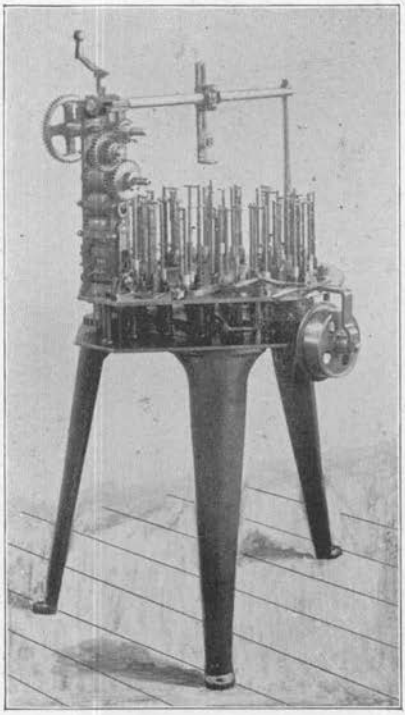


Bobbin revolves on two ball-points.
Standard size of bobbin: 1⅜ inch diameter, 4 inches traverse.
Carrier can be made to fit any size or style of bobbins.

By depressing the spring the bobbin is put in its place. The length of the spring is so adjusted that it merely carries the bobbin without exerting any pressure upon it.

32 Carrier Round Braider,

with press roller take-up and belt drive, for tubular braids and shoe laces.

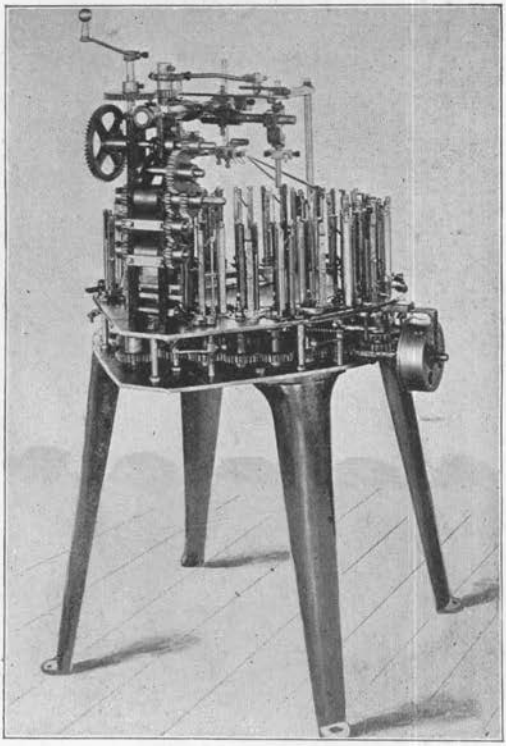


This is a very convenient machine for tubular braids and shoe laces.

Made with square pipe carriers or patent carriers, with outside weight. With belt drive on long legs, as shown, or for table drive.

49 Carrier Braiding Machine,

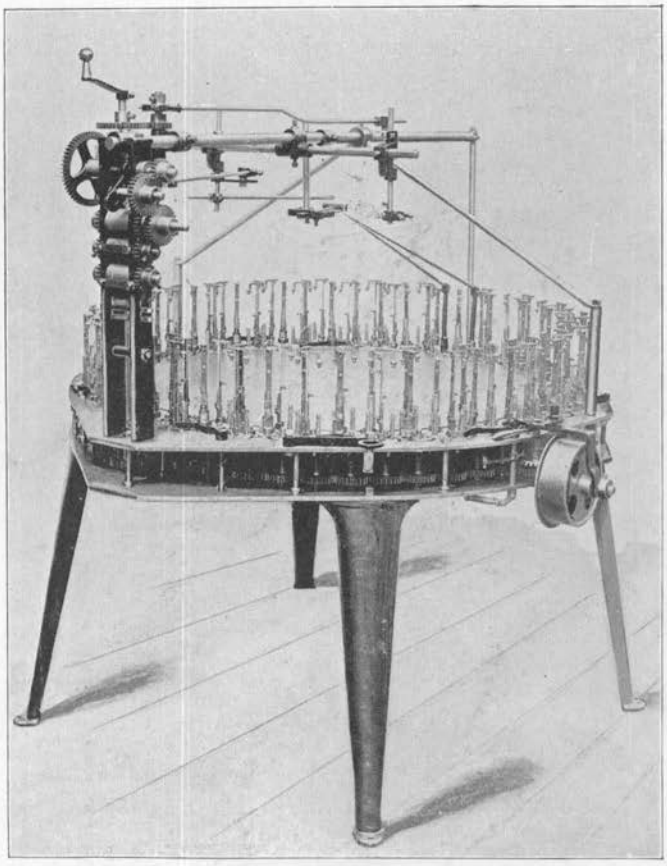
on legs, with drive belt, take-up roller stand and beaters.



This cut shows a 49 carrier machine, with square pipe carriers, steel top and bottom plates, cut gearing, centre gear and beaters. It is placed on legs and with belt attachment, but the same machine can also be run by gearing. It is a strictly high grade machine and can be used for silk and mohair bindings or any other braids within its range.

105 Carrier (26 line) Braider,

with belt drive, take-up roller stand and beaters.

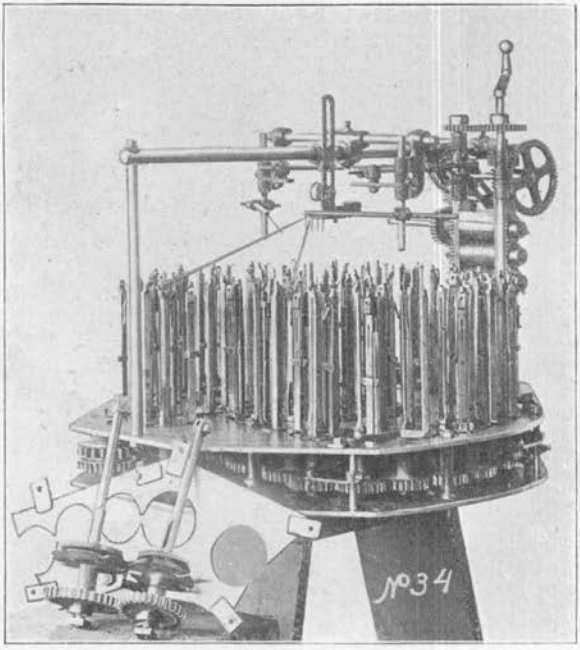


The 26 line machine shown in this engraving is used for making wide skirt braids and tailor bindings. The machine has steel plates, cut gearing and steel gear bolts. It is provided with a large centre gear which distributes the power evenly over the whole circumference and reduces the strain on the gear wheels to a minimum, the load being divided by twelve or more connection gears into that many parts. The beaters on the machine are geared two to one and are therefore quick acting, which is necessary on such a large machine.

These machines can be built on legs with belt attachment, or for table drive, and with any style of carriers.

Cord-edge Braid Machine,

with 19 carriers on the cord and 49 carriers for the flat braid.

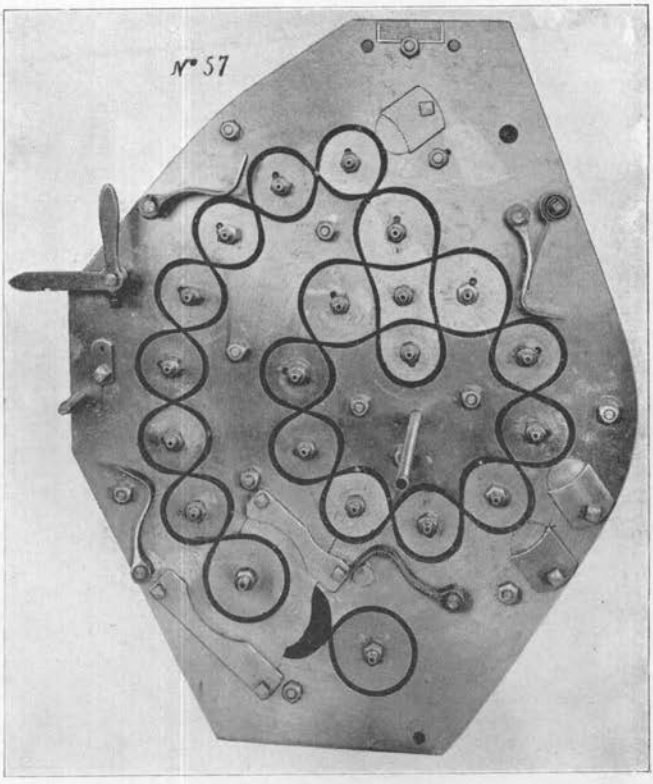


Carriers, 9 inches long.

Machine can be changed to regular 49 Carrier Flat Braiding Machine.

For table or belt drive, with beaters.

Can be provided with attachment for brush braid.

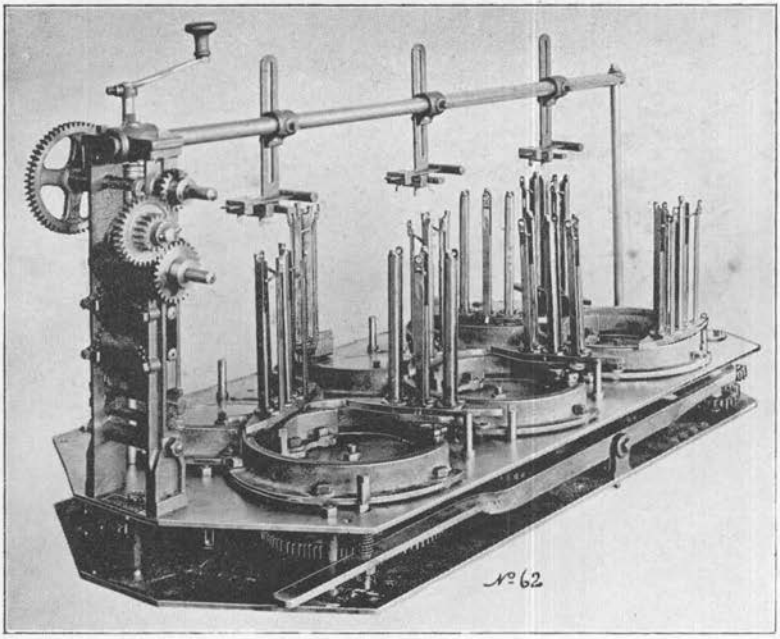


Top Plate of 19 and 25 Carrier Cord-edge Machine,
with change to 19 and 21 Carrier.

3 Head 13 Carrier Soutache Machine,

arranged for Fancy Plaited Soutache.

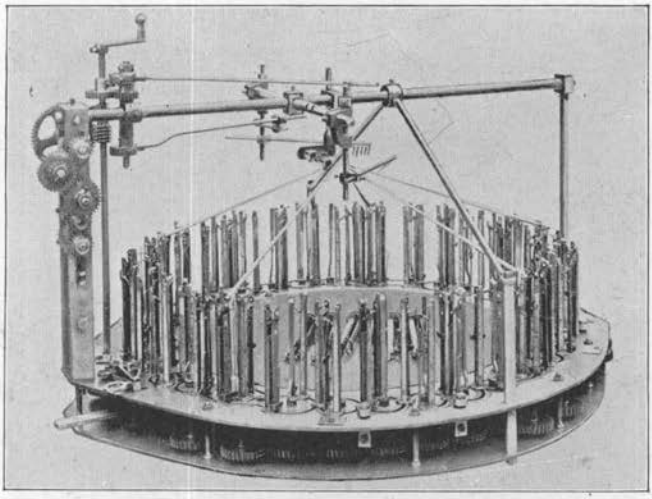
3 Triple Carriers mounted on shuttles which move in guides. These guides have openings on both sides and allow the shuttles to revolve on their bases to prevent twist in the strands.



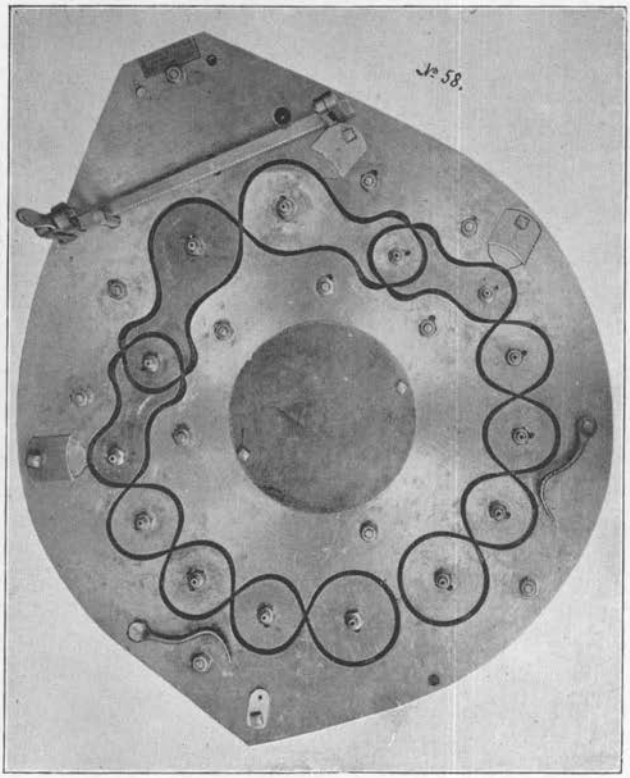
The machine is strongly built, positive in action and can be run at a high speed, and used for heavy or fine work.

By taking off the guides and using ordinary carriers the machine can be used for regular 13 carrier Soutache Braids.

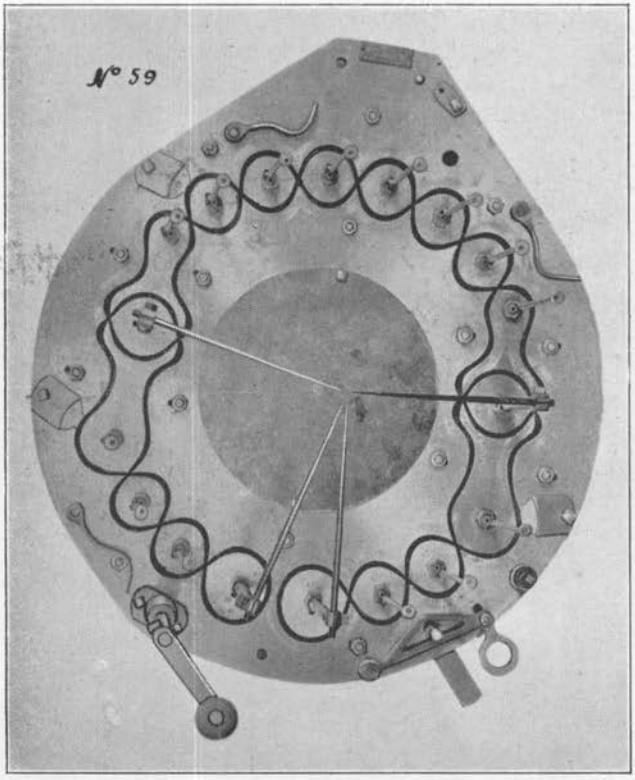
5 Row Fancy Stripe Braid Machine.



The machine in this engraving is intended for making fancy braids. The circumference of the machine is divided into five sections. Each of these sections carry a distinctive set of carriers which form a narrow braid. The different sections of the braid are interwoven by means of the carriers of one section twisting around the carriers of the other section on the turn plates. The whole fabric, therefore, shows a striped pattern—in this case of five rows. Each one of these rows may be made with a different color or material, and a great many patterns can be produced in this way.

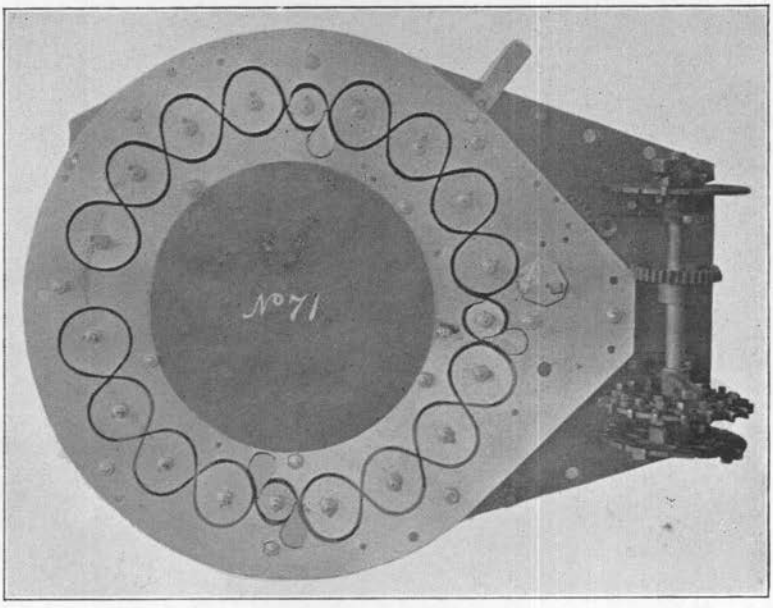


Top Plate of a 3-row Stripe Braid Machine,
12-9-12 Carriers.



Top Plate of a 3-row Stripe Braid Machine,
12-21-12 Carriers.

Top Plate of 36 Carrier Lace (Cross Binding) Machine.

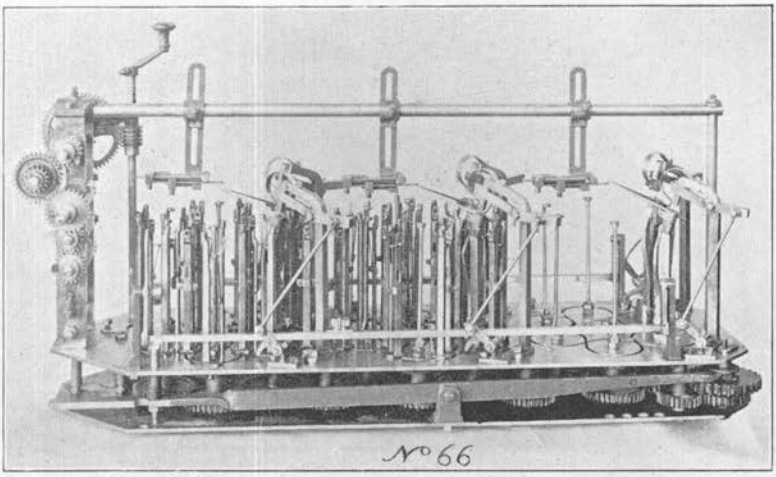


The above cut shows the plate of a Lace-braiding Machine with four sections of nine carriers each. Each section forms a two-line flat braid, and the adjoining sections can exchange threads by the opening of the switches on the two horn gears. These gears serve only the purpose of transmitting and crossing the carriers of adjoining sections, and run empty whenever the switches are closed. The operation of the switches and thereby the formation of the pattern is governed by the pattern disc in the front of the machine.

A great variety of designs in fancy braids can be produced on machines of this kind. Loop attachments can be put on the end plates which augments the range of patterns this machine is capable of producing.

3 Head 19 Carrier (3 line) Hercules Braid Machine,

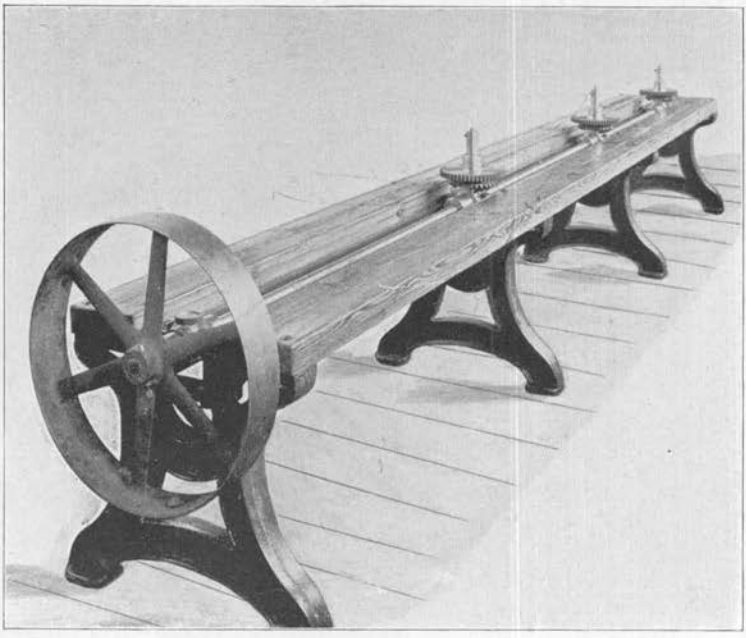
with Loop Attachments.



The above illustration shows a Braiding Machine with Loop Attachments. The machine shown is a 3 Head Hercules Braider of 19 carriers. On the last machine the carriers have been taken off for the purpose of showing the mechanism of the loop attachment more plainly.

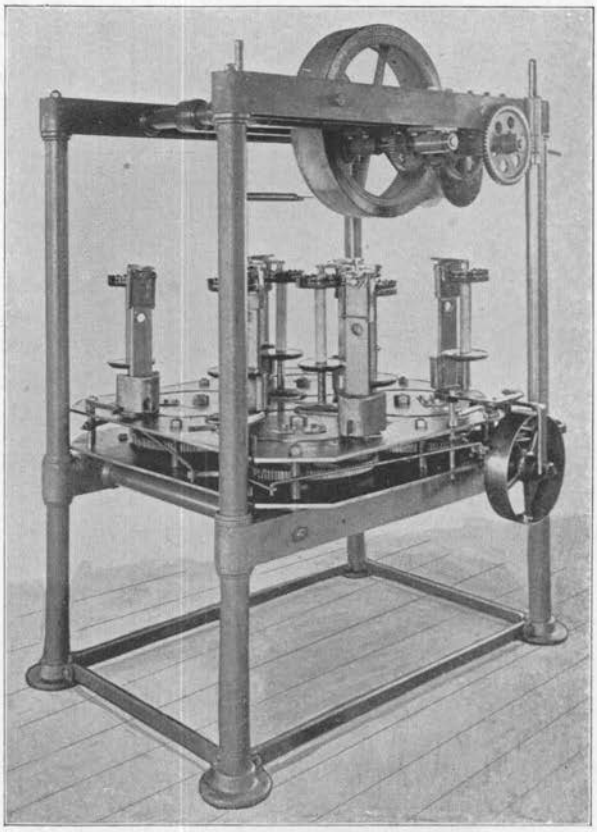
These loop attachments consist of one inside and one outside standard fastened on the machine in such a way that there is an opening of about ¼ inch left between the points, which opening must be in line with the threads and through which the latter pass. A sliding piece is fitted on the points of the standards, which are square, and to this the wires are fastened. When this sliding piece is up (on the outside standard) the threads pass under the wire and do not form a loop. As soon as the sliding piece is pushed down by the action of a collar or slipper on one of the carriers striking against a lever, one or more threads pass over the wire and form loops, until the sliding piece is pushed up again by another slipper striking against the crank lever of the inside standard. The way in which the slippers are put on the carriers determines the pattern. As these collars or slippers on the carriers would strike against the stopper bar and stop the machine, it becomes necessary to raise the stopper bar so that these collars can pass under it, and to put pins in the stem of the carriers to prevent the stoppers on the carriers from dropping down below the stopping bar.

Driving Table



This cut represents our driving table. It is heavy and substantial. The cast iron legs are planed, and wrought iron rails 4 x ¾ inches are bolted to the legs. On these rails the driving boxes move freely as they have milled slots which fit on the rails. These boxes take a shaft 1½ inches in diameter which is provided with ½ inch flat key-way over the entire length. We generally furnish one box with each table, also shaft and pulley. A plank 8 inches wide and 3 inches thick is bolted to the cast iron frame and on this the rear end of the braiding machine is set. The driving sets can be shifted on the table to any position according to the size of the machine they are to drive. Machines are not fastened to the plank but are allowed to swing around an anchor bolt and are kept in position by their own weight. This permits the machines to throw themselves out of gear in case a spool or other obstacle should drop in between the carriers, and prevents breaking of the gears. The machines are placed on wrought iron legs in front, the height of which is adjustable.

8 Carrier Square Packing Braider



Diameter of gears, 16 inches. Spools 9-inch traverse, 6-inch heads.

This machine was designed by us in order to meet a demand for a heavy machine for making square flax packing. It takes a spool of very large proportions, holding a great deal of material. The carriers and weights are very heavy, by means of which it is possible to make a square flax packing of large size in an economical way. There is very little waste of material in operating this machine, and the packing becomes more solid and hard and comparatively free from piecings.

There is no class of braid machines subjected to a severer test than those used by the manufacturers of packing. Strength and good workmanship and material should therefore be of the utmost importance. We know from experience that a great deal of the packing made to-day is made on machines that are inadequate to the requirements, yet have been used for years and have cost several times their original cost for repairs. Every pound of packing thus made costs more than it should, and the quality must show some of the defects caused by defective machinery. The strong, machine-shop-built machine built by us in all sizes remedies all these defects. It can run faster, *almost twice as fast* as the old machines, does *more* and *better* work *at less cost for labor*, on account of using *larger bobbins*. It will pay you to investigate and try one of our machines.

Machines for Covering Electrical Wires.

All our Braiders for covering electrical wires are made with *cut gears.* Top and bottom plates are *steel,* and are accurately worked, as will be seen by referring to some of our engravings of top plates. Our method of construction enables us to make the grooves for the carriers mathematically *correct,* without unnecessary play or lost motion. The quoits or inner plates are fitted on *square shoulders* of the gear axles, and therefore cannot come loose.

The carriers are of our patented construction described on page 32, and the feet are milled on special machines. They fit perfectly and do not wabble, and the result is that our machines can be run at *high speed.* We have known them to perform *twice as much* work as can be done on machines of other make.

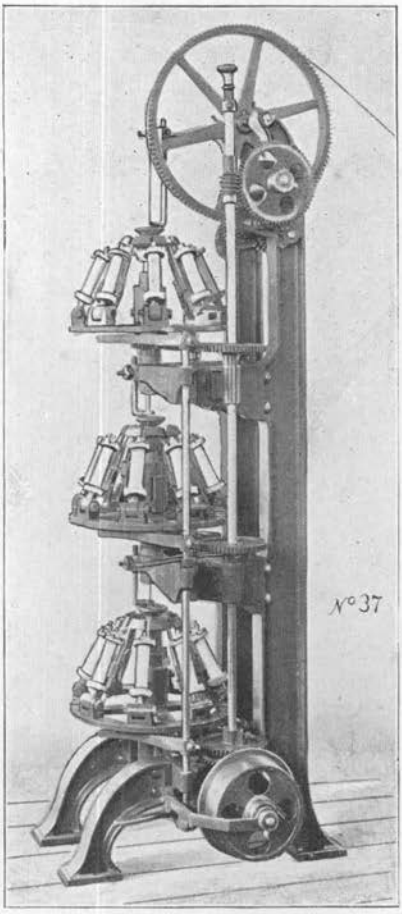
We aim at pleasing and mechanical designs, and make our machines heavy and strong to insure long life, and a very important result from this is the *absence of repairs* for years to come.

We can use *larger bobbins* for the same size of gears, owing to the absence of lost motion; and from this it is evident that our machines are *economical to run.*

Prices on application.

Triple Winding Machine,

for covering Electrical Wires.

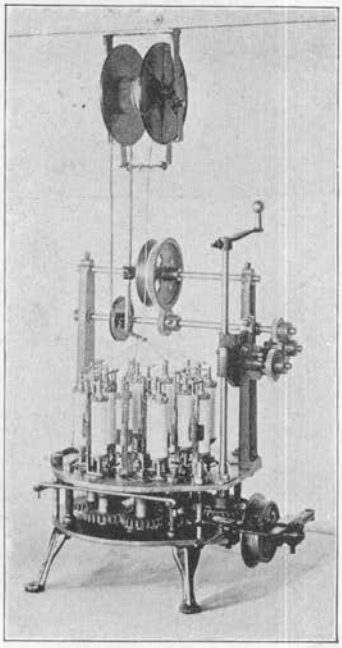


Made in single, double or triple deck. Each carousel can be run either right or left, and at variable speed. Automatic stop motion.

Bobbins, 1¾ x 5 inches.

Single 16 Carrier Braider,

with belt drive,
wheel take-up and reel.

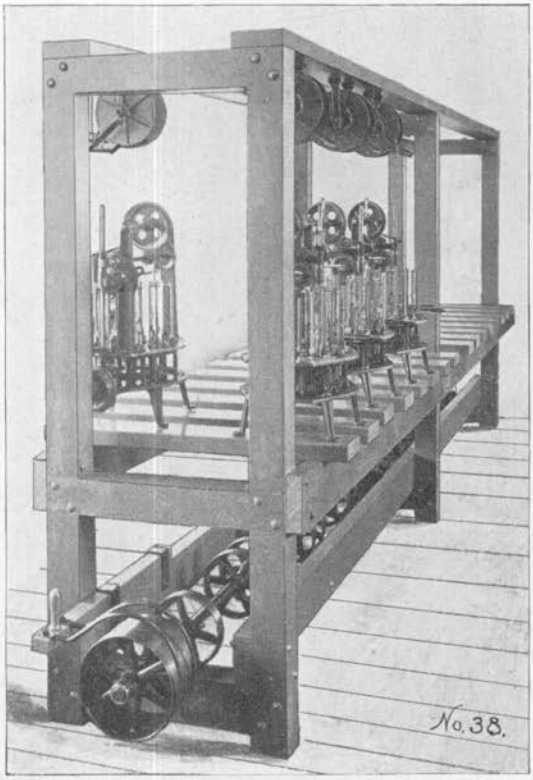


The 16 carrier single braider shown in this cut is a very convenient little machine for making round and tubular braids. It has short legs and pulley drive, and the take-up is regulated by means of change gears which in turn operate a small sheave wheel placed centrally over the machine. A reel and hanger for receiving the finished braids complete the machine.

This machine is also used for covering electrical wires.

Table with 16 Carrier Braiders,

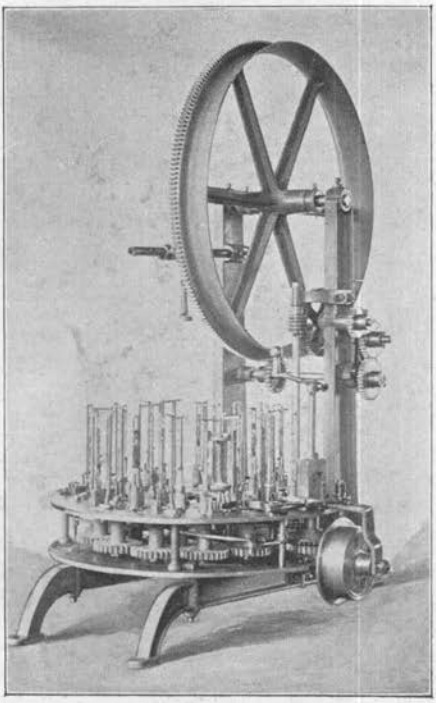
for covering electrical wires
or any other purpose.



This table is very compact and put together with bolts, so that it can be easily taken apart. Also made with automatic traverse.

24 Carrier Braider,

for covering Electrical Wires.

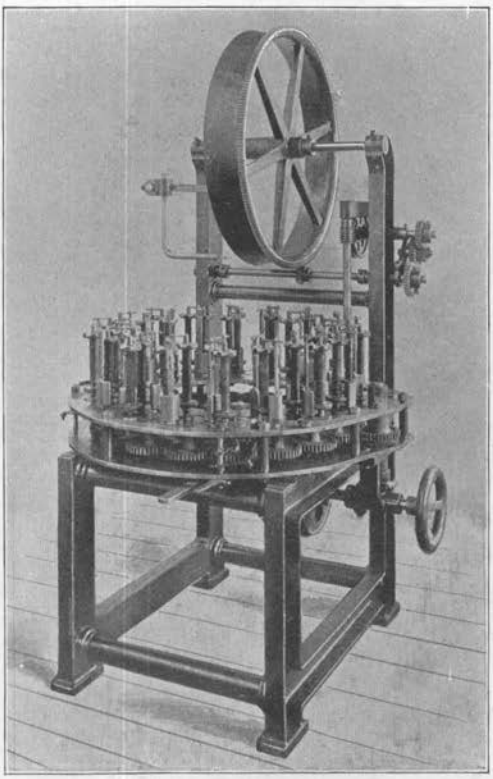


Diameter of geared take-up wheel, 26 inches. Diameter of gears, 3½ inches.
Spools, 1⅝ inches diameter, 3½ inches traverse.

This machine was specially designed for covering electrical wire up to No. 0000 wire gauge. The plates are made of steel, the gears are all cut and the frame is heavy and well proportioned. The take-up consists of a 26-inch wheel with teeth cut on the outside, which is driven by change gears conveniently located on the outside of the standard. By means of these change gears the take-up can be instantly changed and it allows of very fine graduations. The worm and worm gear are all cut, and an extra crank shaft is provided to turn the machine by hand.

36 Carrier Braider,

for Covering Electrical Wires.



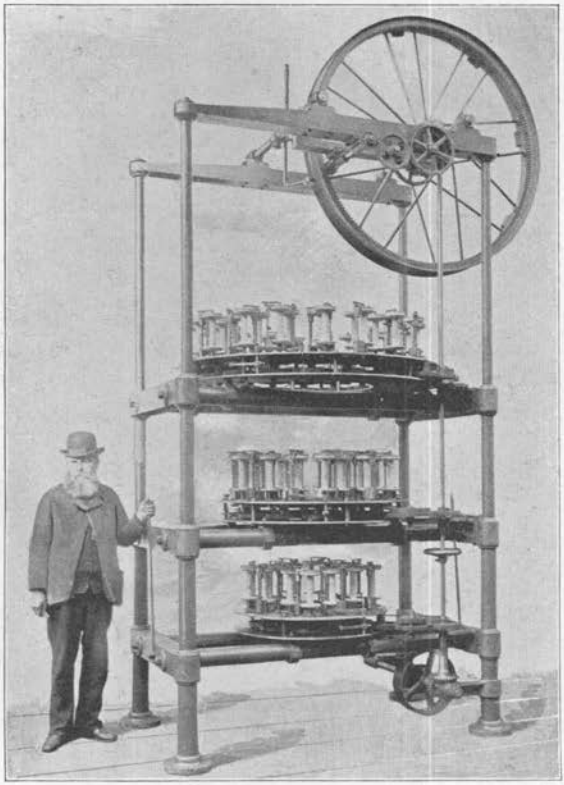
Diameter of gears, 4½ inches. Spools, 2½-inch heads, 6 inches traverse.
Geared take-up wheel, 32 inches.

This cut represents a heavy and compact braider of 36 carriers, for covering electrical wires in medium and heavy sizes. The machine has extra heavy steel plates, cut gears and steel bolts, and is capable of turning out good work at a high speed. The take-up is regulated by means of change gears arranged on the outside of the standard and changes are quickly made.

Extra Heavy Triple Braider,

for covering cables.

Lower Deck, 16 Carriers, Middle Deck, 24 Carriers.
Upper Deck, 36 Carriers.



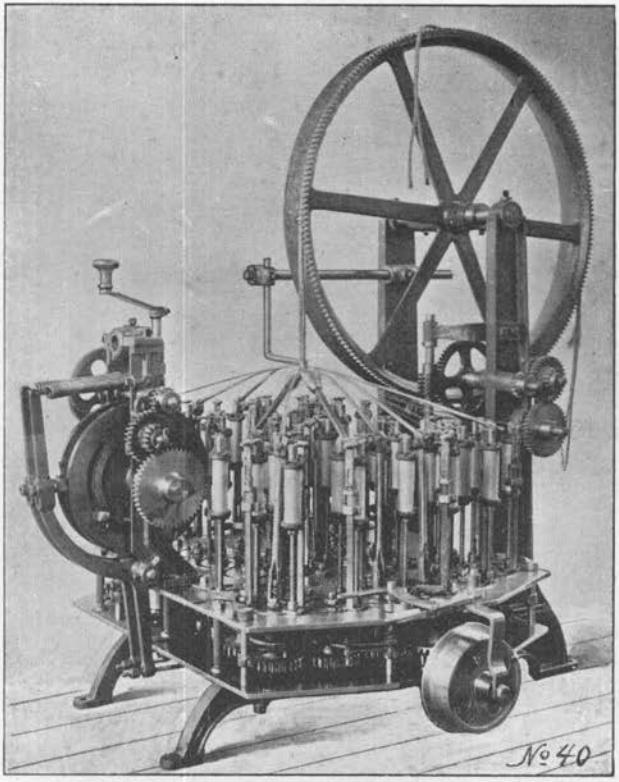
Diameter of geared take-up wheel, 60 inches
Diameter of carrier gears, 8 inches
Spools 8 inches traverse, 4½ inch heads

The machine shown in this engraving was designed for covering extra heavy cables. The machine is seventeen feet high, and weighs about 7000 pounds. The spools are very large and the whole machine is of heavy construction, calculated for the work it is intended for. It is probably the largest braider of this kind ever built.

Braiding Machine with 48 Carriers,

for making

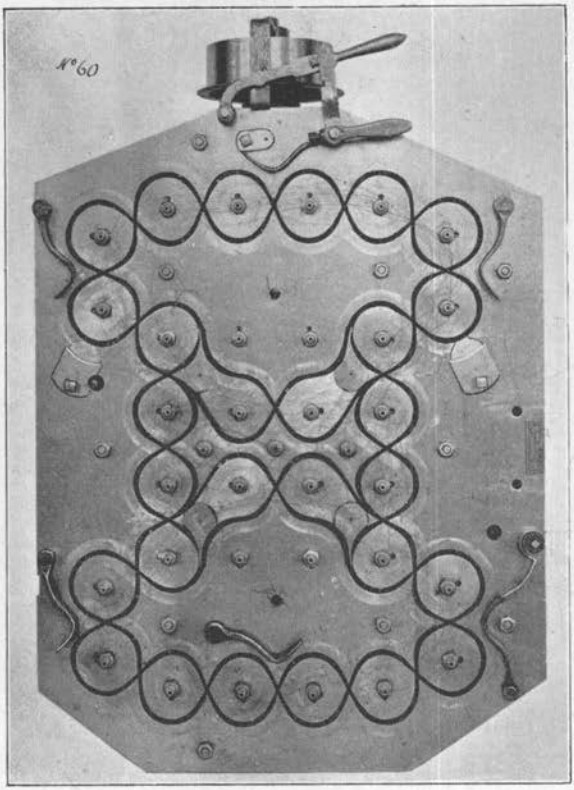
Telephone Receiver Cords Automatically.



The machine shown in the above cut has been invented and built by us for making telephone cords in one operation. It has 48 carriers and is so arranged that it will make a large tubular fabric with 48 spools, to cover the heavy portion of the cord. When the proper length is made the automatic switch, shown on the front of the machine, changes the motion in such a way that two tubular braids of 24 threads each are formed. These 24 carrier braids form the forked end of the telephone cords connected with the receiver. The entire length, and also that of each portion, can be regulated and it is only necessary to cut the cord produced by this machine at the proper distance to get the finished article without waste.

Plate Showing Curves and Switches

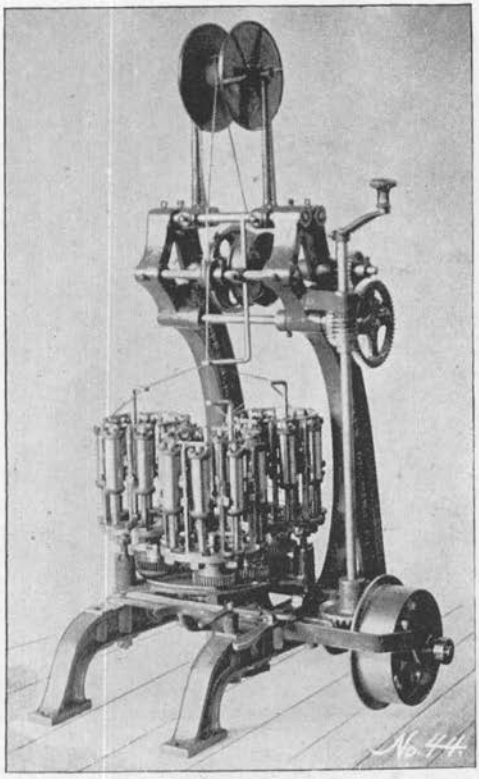
of Automatic Telephone Cord Machine.



This illustration shows more clearly the manner in which the change from a machine of 48 carriers to *two machines* of 24 carriers is effected. With the switches in the position as shown the machine makes two cords of 24 strands each.

Cord Twisting Machine,

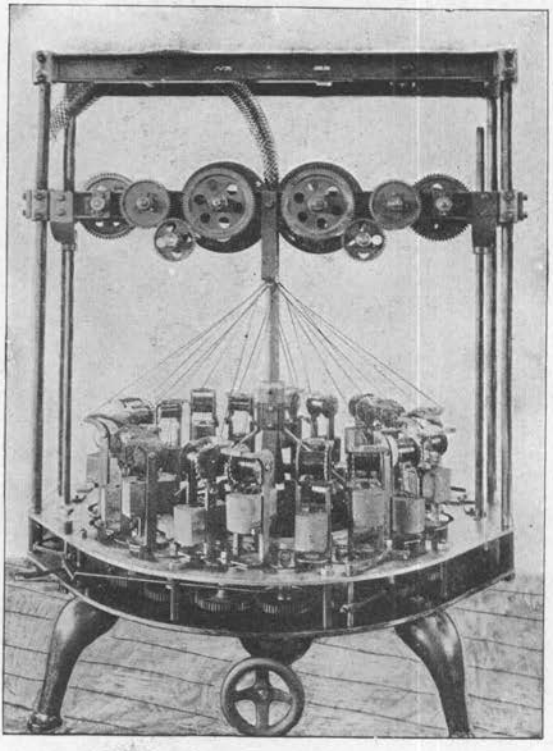
for making Solid Cords out of Metal Wire or Tinsel Threads, Cotton, Silk, Mohair, or any kind of yarn.



The machine here shown is used by manufacturers of electrical wires for making cords used in connection with medical batteries, and also with telephones and other instruments. It is also used for making cords for trimming purposes. The wire or thread is wound on bobbins placed on carriers; the same as used on braiding machines. The cord is finished in one operation, and the reverse twist put in. A stop motion is provided which stops the machine when a thread runs out or breaks off.

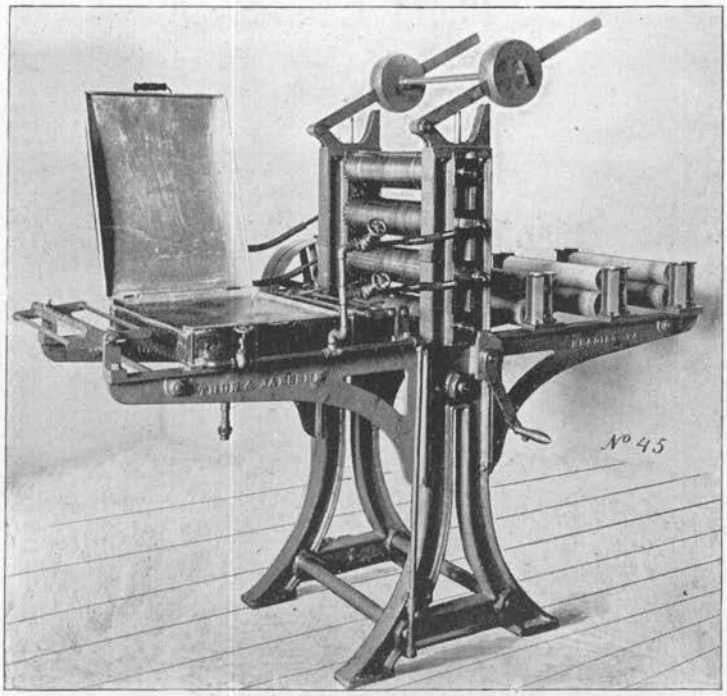
Machine is also made with tight and loose pulley and automatic traverse motion. Can be used for right or left twisted cord.

Flat Steel Wire Braider



The above cut shows a machine built by us for braiding flat steel wire. The product of this machine is used as an armor for electrical cables and for rubber hose. Our patented horizontal carriers are used on this machine, which prevents kinks in the material. We build these braiders with 10, 12, 14, 16, 18, 20 and 24 carriers, and furnish wrought iron spools for the wire. A steel tubing up to 10 inches in diameter can be produced on these machines.

Finishing and Calendering Machine



This cut illustrates a machine for calendering braids. It consists mainly of four brass rollers 18 inches wide. The large one is 4¾ inches in diameter and the three upper ones 4½. Two of these rollers are heated by steam. All the rollers are connected by gears to make the motion a positive one.

This machine is adapted to finish all kinds of trimming braids, such as Hercules braids in worsted and mohair or in silk and cotton, flat and tubular braids. The pressure on the rollers can be regulated by means of the lever and sliding weight which press on the box of the top roller. The construction of the machine is such that the three top rollers are lifted simultaneously by means of the lever which stops the machine. The bearings for the rollers are bronze boxes sliding in a cast iron housing. In stopping the machine the rollers are lifted up about one inch between each two rollers to make it more convenient to feed the braid through the rollers.

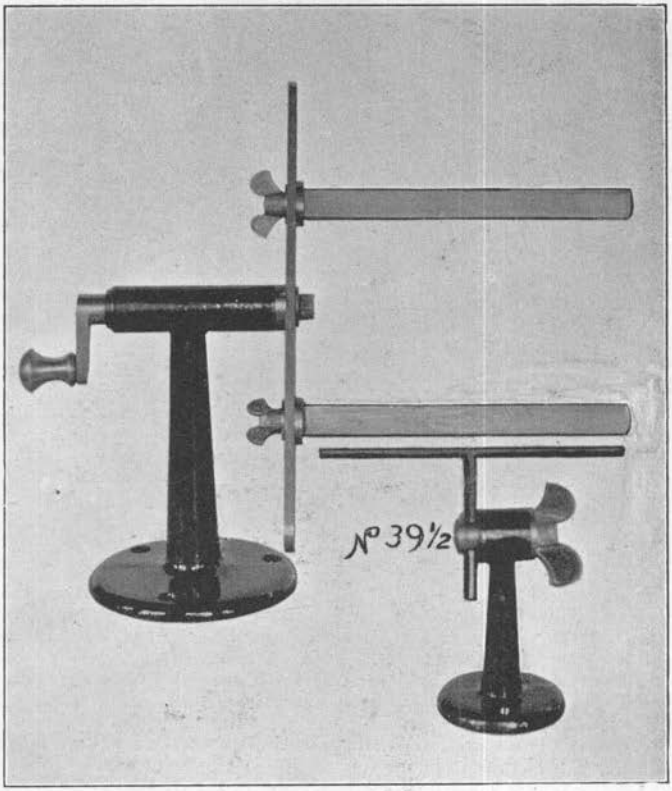
Immediately behind the machine is a copper steam chest which is connected with a live steam pipe and serves to make the braid pliable, hot and moist before it passes through the rollers.

We build these machines generally with wooden take-off rollers, shown in cut. These rollers serve to deliver the braids into cans after they have come out of the machine.

The usefulness of this machine in improving the appearance of narrow fabrics is now generally recognized. For the small cost involved by the running of this machine the results of making the goods, even the cheapest kind of cotton tapes, more salable pay tenfold, and no manufacturer can afford to be without it.

We build this machine also with rollers 36 inches in width and a high take-off machine attached, which delivers the braids into 36 cans placed under it.

Hand Lapper.

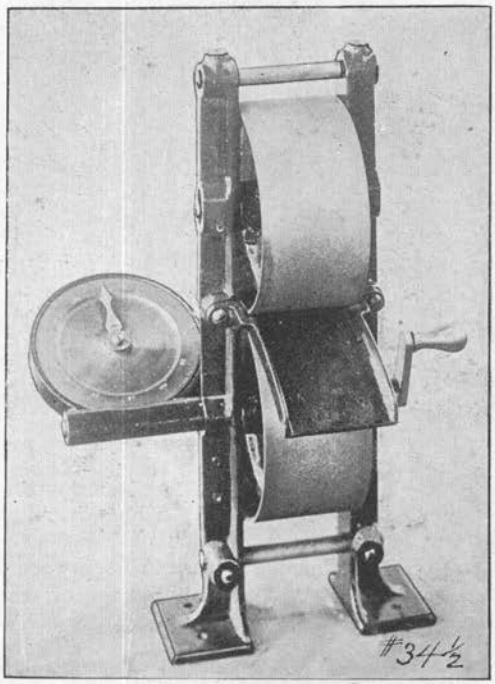


This little machine is used for lapping braids and trimmings. Lapper and hand rest are screwed fast to a table, and the hand rest can be adjusted to any position. The blades of the lapper are made from steel, and are split so as to allow of sliding in a piece of paste-board. The distance between the blades can be regulated to suit the length of the pieces that are to be made.

Measuring Machine.

Single Dial.

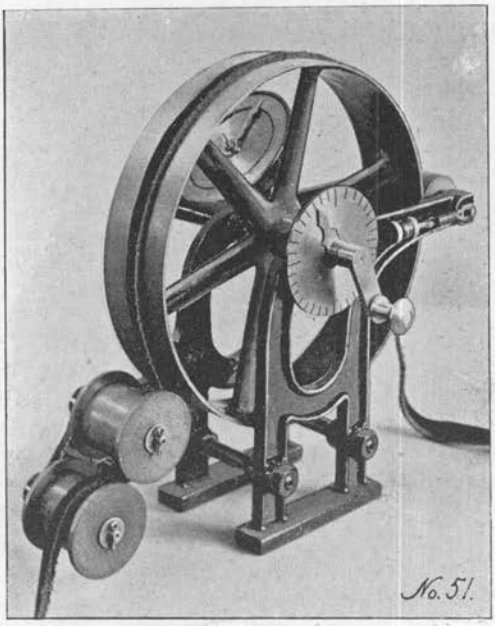
Registers 144 yards. Each revolution of handle, 1-2 yard.



This machine is very useful for measuring Hercules and other firm braids and trimmings. The rollers are 18 inches in circumference and made of iron.

Measuring Machine,

with Two Dials.

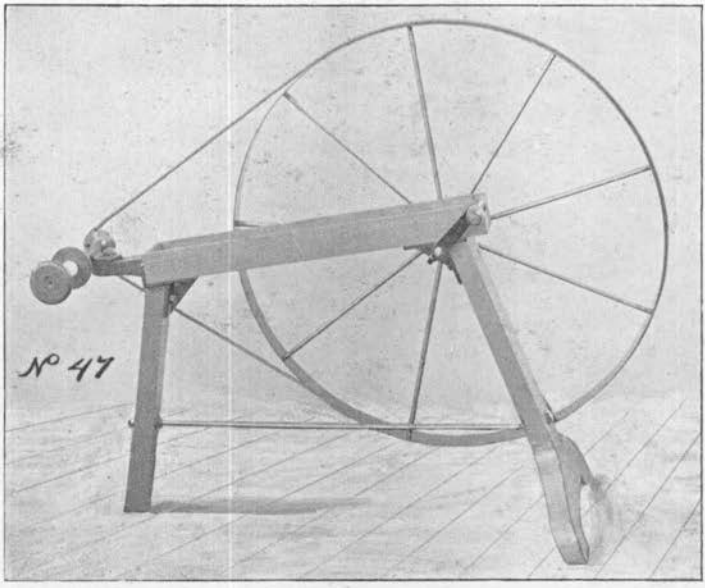


The Measuring Machine shown in this cut is one of the most convenient and useful labor saving devices ever offered to the manufacturers and dealers in trimmings and narrow fabrics. The braid or trimming is carried without tension over a measuring wheel of exactly one yard circumference. A dial in front of the machine registers every inch, while the hand on the large dial driven by a worm indicates the number of yards up to one gross.

The machine measures absolutely correct, much more so than can possibly be done with a yard stick by hand, and will do *ten times* as much work. We have sold a great many of these machines, as high as six to one firm, as they are put on different floors or departments of a factory, and very soon pay for themselves.

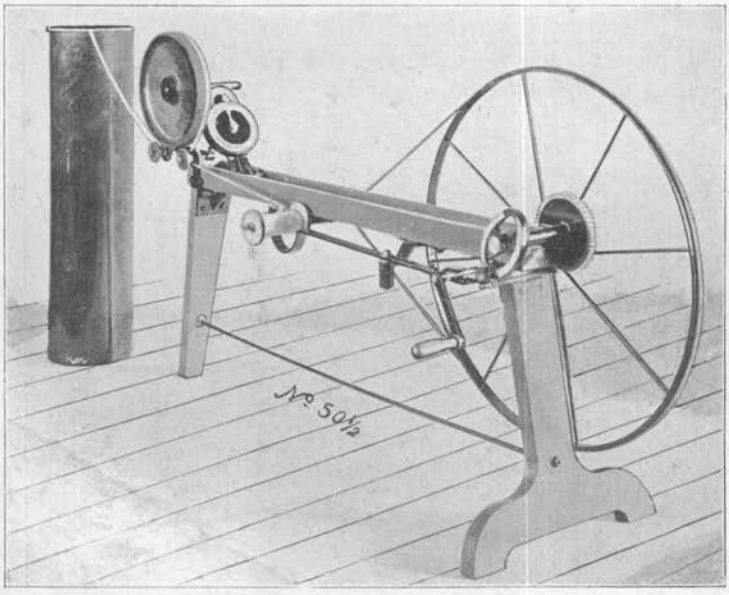
The machine is also made for power drive, and provided with a compound dial to register 1000 yards for measuring tapes. Generally this machine is fastened on a table but we also mount it on a column 36 inches high to, facilitate using it in different parts of a factory.

Hand Spooling Wheel.



This spooling wheel has iron spokes and rim. Both the shaft of the wheel and the spindle have a long bearing. The spindle can be easily taken out and another one for a spool of a different size substituted. Several sizes of spindles can be furnished with one wheel. Provision is made to tighten the belt by a slide for the spindle bearing. This wheel is very strong and yet very light running.

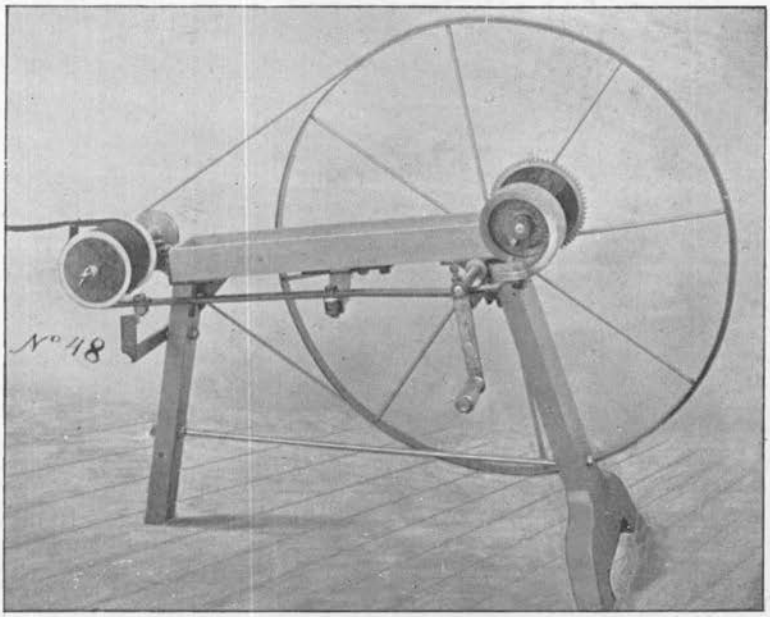
Machine for Spooling and Measuring Braids and Tapes.



This machine is arranged for spooling and measuring soutaches, cords, braids, etc. on large spools, containing 1 gross to 1000 yards. The measuring machine has a compound dial registering up to 1000 yards, and so arranged that it can be set back to zero. According to the size of the cam the wheel will make spools of any desired traverse, and by shifting the fulcrum of the lever provision is made for an adjustment of the traverse within a limit of one-fourth of the total length.

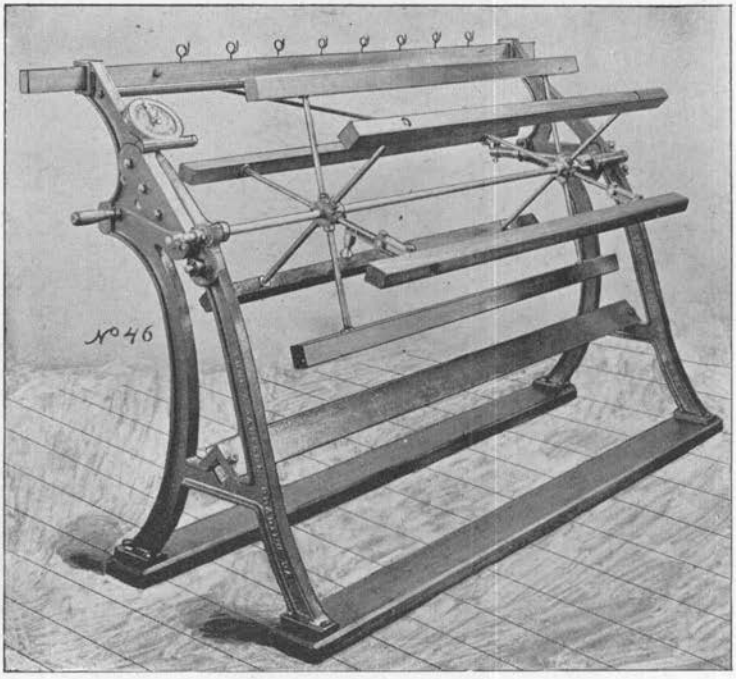
Hand Spooling Wheel,

for Spooling Braids.



This machine is the same as the one shown on the preceding page, but without the measuring attachment. The spindle shown on the cut is arranged for paper spools, and has two large iron flanges to support the heads. A thumb nut with a worm thread is used for tightening the spools on the spindle.

Reeling Machine

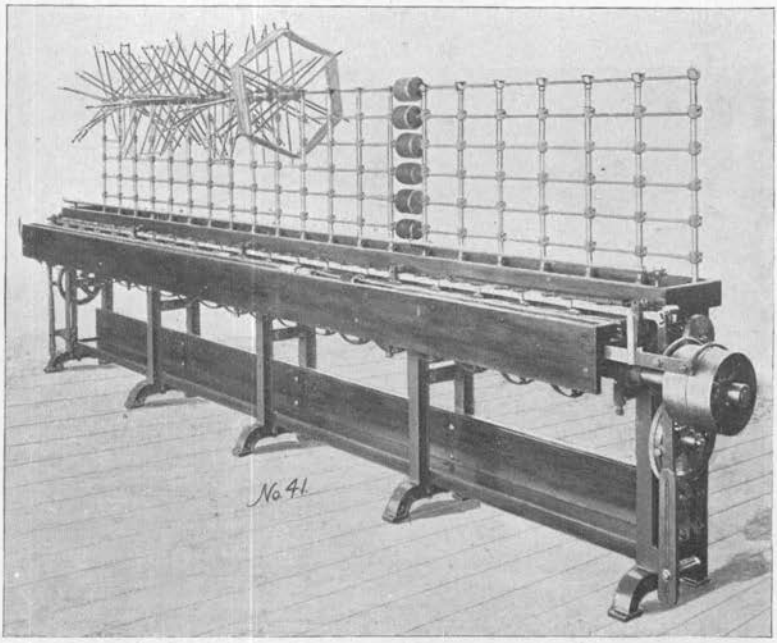


The reel shown in the above cut consists of an iron frame, the reel proper or drum, a traverse bar with automatic oscillating movement, and a measuring dial. The reel shaft runs at one end in a bearing with universal knee joint, allowing of swinging it in every direction; the other end can be lifted out of its bearings for the purpose of taking off the skeins. The spokes or arms are made from steel and one of them is made collapsible. By pulling the knob shown in the engraving this arm will drop down, the tension on the skeins is released and they can be taken off.

Circumference of reel, 2 yards. Length of reel, 4 feet. Can be made longer if desired.

Spooling Machine.

(WINDER)



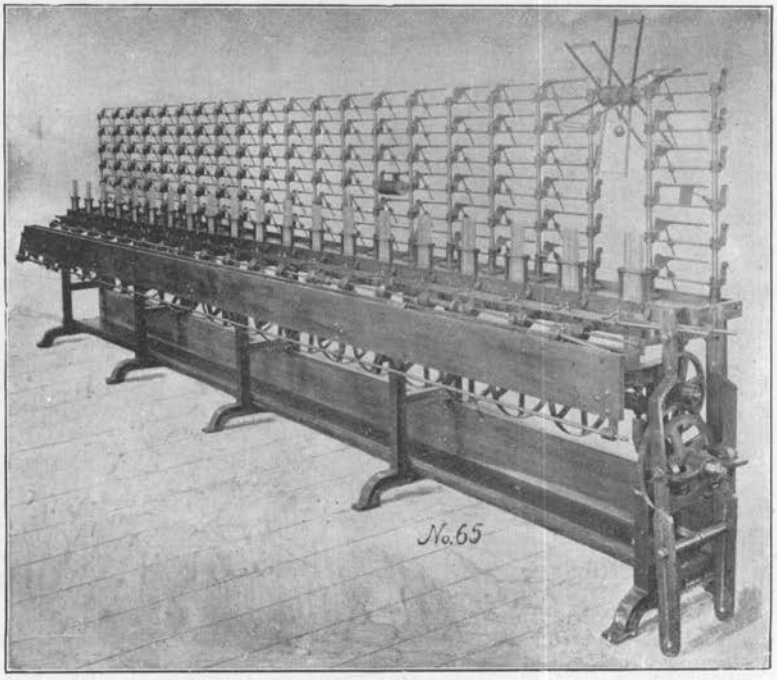
The Winder, shown in this cut, is made with an iron frame—strong, stiff and compact. The shaft runs in boxes which are vertically adjustable, thus securing perfect alignment. The pulleys are of iron, 10 inches in diameter and 1¼ inch face.

The spindles are made of tool steel turned from the solid and tempered at both ends. Their heads are made of compressed leather washers held between iron flanges. The leather spindle heads running on iron pulleys give a perfect friction contact. Diameter of head and weight of spindle can be varied, according to the work the machine has to do. The traverse guide is operated by a cam on one end of the machine. This cam is made with 1¼, 1½, 2 and 2½ inches throw, and is accurately *milled* on a special machine and is absolutely true, the result of which is a perfectly wound spool. The length of the traverse can be adjusted by means of the lever which conveys the motion to the guide bar.

If desired, two sizes of spools can be made on the winder at the same time, and on any of the spindles. In order to allow this, a second lever is placed on the same cam (see cut of Doubler on following page) and a second guide bar placed immediately behind the first. The thread guides are mounted on a clamp, which can be fastened either on the front or on the rear bar while the distance of the eyes from the centre of the spindle remains the same. A stop motion is provided to stop the spindle when the spool is full. The swifts are made light yet strong, and either for wollen or cotton skeins. We use elastic cords to connect the ends of the sticks—as these yield sufficiently to put on the skeins. A trough for laying down the spindles and spools forms the top of the front board, and a shelf for empty spools serves as a base for the iron standards.

This machine is guaranteed to make perfect spools, and is made for continous running—strong and not liable to need repairs. It is elastic in regard to length and size of spindle and can therefore be made for *all sizes of spools*, and with any desired *number of spindles*.

Doubling Machine.

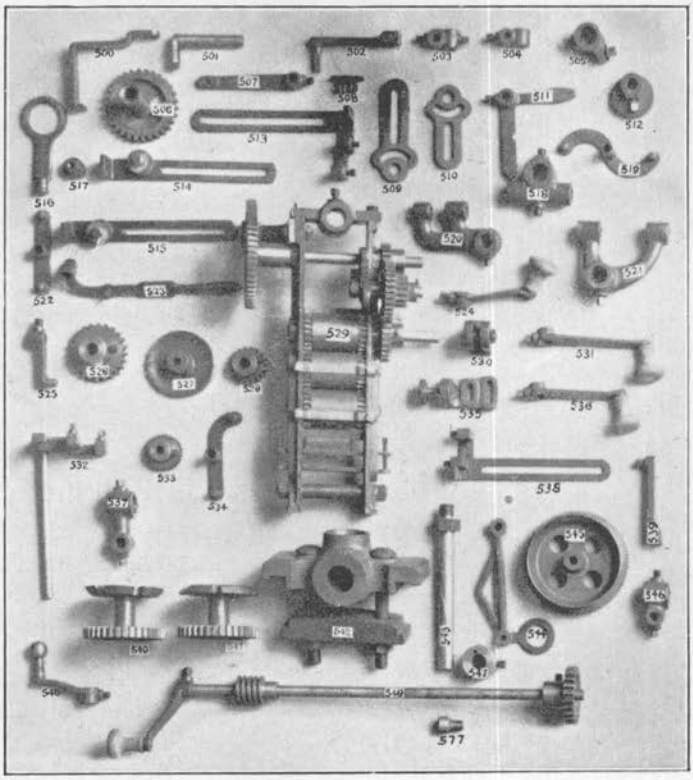


The description on the foregoing page of our Winding Machine covers to a large extent also our Doubler. The spindles are of the same general construction, but are heavier in accordance with the work they have to do. These machines are arranged for doubling up to 6 ends, but if it were required two frames of the rack could be used and up to 12 ends wound on one spool. An automatic stop motion consists of an iron frame with 6 wooden sticks, of which each carries a thread eye or hook and is held suspended by the tension of the threads. As soon as an end breaks or a spool runs out the stick drops down and strikes the long end of a balance lever, the short arm of which carries a steel point, and the latter strikes the teeth of a fine ratchet on the spindle, thereby throwing it out of contact with the pulley by lifting it and coming to a stop. This stop-motion works very rapidly, and the broken end does not get as far as the thread guide before the spindle stops.

A brake with extension wire is provided to secure tension on the winding spools in the frame. A sliding weight fits this wire and can be fastened by means of a knurled set screw in any position to get more or less tension on the spools.

On the following pages will be found a list of parts of Braiding Machines and also a classified list of all the machinery manufactured by us.

Names of Parts of Braiding Machines.



Belt attachment parts.

500. Pulley shifter.
501. Draw-out bolt, 3½ in. long, for belt attachment
511. Catch handle for stop motion (belt drive).
523. Pulley-shifter-handle.
597. Bevel clutch gear, 24 teeth, light.
598. Pulley 4½ in.
599. " 5½ in.
600. " 6½ in.
601. " 7 in.
609. Bevel gear and driving gear of belt drive, light pattern.
621. Bevel gear, 33 teeth, 8 pitch, for belt drive.
622. Bevel gear, short hub, 22 teeth.

Take-up parts.

509. Quadrant with 3 in. slot.
510. " " 2 " "
529. Take-up roller stand, 16 in. × 2½ in. complete.
545. Sheave pulley for small round braiders.
553. Gear stud for quadrant.

Stop motion parts.

502. Cradle post with square pin for spring, 4½ in. high.
507. Stop motion arm, 5 in. long.
508. Joint for connecting cradle bars.
519. S. swivel for stop motion.
522. Straight swivel for stop motion.
534. Bent swivel for stop motion.
539. Cradle post, round pin, 4½ in high.
544. Stopper handle.
555. Catch pin for stop motion.
607. Stop motion turn lever, right.
610. Stop motion arm, 2¾ in. long, back set screws.
611. Stop motion arm, 2¾ in. long, right set screws.
612. Stop motion arm, 2¾ in. long, left set screws.
615. Stop motion turn lever, left.

Beaters, etc.

503. Cross head for holding beaters.
504. Cross head for eccentre rod.
512. Eccentric disc.
518. Support for cross bar.
520. Holder for beater shafts.
521. Holder for eccentre spindle.
525. Crank for connecting beaters.
593. Beater 14 in. long.
613. Beater arm with 2½ in. slot.

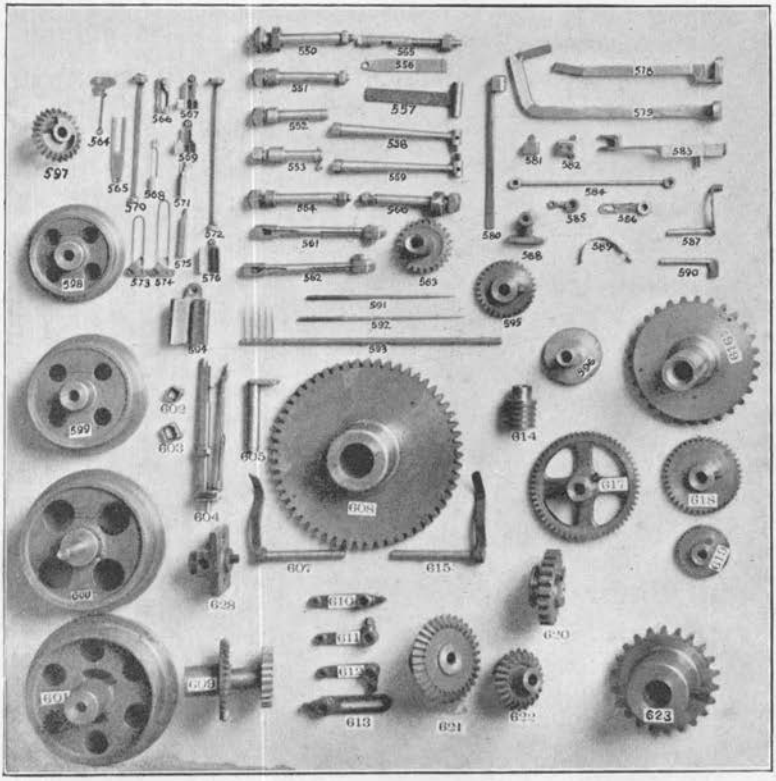
Braid formers, holders, etc.

505. Support for former holder with flat shank.
513. Former holder, medium size, flat shank.
514. Former for round braids.
515. Former holder for soutache braids
516. Eccentre strap.
532. Former holder for wide braids, with round shank.
537. Support for round shank former holder, 2¼ in. throw.
538. Former holder for narrow braids, flat shank.
546. Support for former holder, 1¼ in. throw.
556. Braid former, ⅝ in.
557. Braid guide, 1¼ in.
565. Braid former for soutaches.

Gears.

506. Lower clutch gear, 8 pitch.
526. Front gear, 24 teeth, 8 pitch.
528. Change gear, 19 teeth, 10 pitch.
533. Change gear, 31 teeth, 16 pitch.
540. Six horn gear, high.
541. Six horn gear, low.
563. Connecting gear, 24 teeth, 8½ pitch.
595. Change gear, 30 teeth, 10 pitch.
618. Change gear, 40 teeth, 10 pitch.
619. Change gear, 44 teeth, 16 pitch.
620. Clutch gear, 20 teeth.

Names of Parts of Braiding Machines.



Handles.

524. Handle, 3½ in.
531. " 5½ in.
536. " 4½ in.
548. " 2½ in.

Driving sets.

542. Box for driving table.
543. Driving gear pin.
547. Collar for driving gear pin.
608. Driving gear, 55 teeth.
616. Bevel gear, long hub for table drive.
623. Bevel gear, short hub, 22 teeth, for table drive.

Gear bolts (axles).

550. Draw-out gear bolt.
551. Gear bolt (axle) for connecting gear.
552. Connection gear stud.
554. Horn gear bolt (axle).
560. Change gear bolt for change to diamond.
605. Draw-out bolt for clutch gear.

Needle posts.

558. 7 in. needle post, left (light pattern).
559. 7 in. needle post, right, light pattern.
561. 7 in. needle post, left, (heavy pattern).
562. 7 in. needle post, right, (heavy pattern).

Carriers and parts of carriers.

564. Sheet iron stopper, 3 in. long, with china eye.
566. Top weight, 2 in.
567. 1 oz. weight.
568. Weight with china eye, No. 20.
569. ⅝ oz. weight.
571. Top weight, 2 in.
573. Wire stopper, 3¼ in.
574 " " 4¼ in.
575. Lead weight, No. 60, steel eye.
576. Weight, 1½ oz.
594. Weight, 1 lb.
602. Adjustable bobbin holder, small pattern.
603. Adjustable bobbin holder, large pattern.
604. Square pipe carrier with bobbin holder.

Warp guides.

570. Warp guide, 7 in.
572. " " 9 in.

Loop attachment parts.

578. Inside standard.
579. Outside standard.
580. Lifter.
581. Dog.
582. Double slipper (collar).
583. Hammer.
584. Connecting strap.
585. Inside crank.
586. Outside crank.
587. Outside arm.
588. Bearing for outside arm.
589. Spring.
590. Inside arm.

Needles.

591. Needle, 8 in.
592. " 9 in.

Miscellaneous.

517. Step for worm shaft.
527. Groove pulley, 3½ in.
530. Lever claw, $\frac{5}{16}$ slot.
535. Adjustable lever joint.
549. Worm shaft, complete.
596. Bushing for centre gear.
614. Worm.
617. Worm gear, 56 teeth, right

Soutache Braiders.

with 7, 9, 11, 13, 15, 17 Carriers.

Machines for making:

DIAMOND SOUTACHE BRAID, with 8 and 10 Carriers.

LAMP WICKS, with 3 and 5 Carriers.

FANCY PLAITED SOUTACHE, with 3 Triple Carriers.

Flat Braid Machines

PLAIN, with 9, 13, 17, 21, 25, 29, 33, 37, 41, 45, 49, 53, 57, 61, 65, 69, 73, 77, 81, 85, 89, 93, 97, 101, 105, 109, 113, 121 Carriers

DIAMOND, with 10, 14, 18, 22, 26, 30, etc., to 122 Carriers.

Changes to 3 horn gears on all lines, if desired.

Hercules Braid Machines

with 13, 19, 25, 31, 37, 43, 49, 61, 73, 85, 97, 107, 121, 133, 145 Carriers.

President Braid Machines

with 8 Carriers.

Fancy President Braid Machines

with 12 Carriers.

Round Braid Machines

For Cords, Tubular Braids, Moulds, etc.

with 8, 12, 16, 20, 24, 28, 32, 36, 40, 44, 49, 52, 56, 64, 72, 96, 112 Carriers.

Hercules Cord Machines

with 12, 18, 24, 36, 48, 60, 72 and 96 Carriers.

Cord Edge Braid Machines

with 19 and 21, 19 and 25, 19 and 49 Carriers.

Square Machines

with 8, 12 and 16 Carriers.

14 Carrier Square Machines.

12 and 16 Carrier Coral Braid Machines.

Stripe Braid Machines

with 2 STRIPES	with 3 STRIPES
9 and 6 Carriers	6-9-6 Carriers
9 and 9 "	12-9-12 "
12 and 6 "	9-12-9 "
12 and 10 "	9-21-9 "
12 and 12 "	12-21-12 "

with 4 STRIPES	with 5 STRIPES	with 6 STRIPES
9-12-12-9	12-9-12-9-12	6-9-12-12-9-6
6-9-9-6		

or any desired arrangement and combination of Carriers.

Pearl Hercules Machines

from 1 to 10 lines, producing a flat Hercules Braid with a figure laid on by carriers running crosswise through the others.

Lace Braid Machines

(*a*) Jacquard Machines, in which the switches are operated by collars on the Carriers, with 18, 27, 36, 45 and 54 Carriers.

(*b*) Cross-Binding Machines, in which the switches are operated by pattern-discs, and the carriers cross on 2 horn gears, with 18, 27, 36, 45 and 54 Carriers.

(*c*) 2, 3 and 4 thread Lace Machines for making Torchon Laces.

Winding Machines

for winding yarn from skein or cones.

Doubling Machines

for doubling any desired number of ends on braider bobbins or warp spools, with stop-motion.

Spooling Wheels (hand spooling)

Spooling Wheels

for spooling braids, with or without measuring attachment

Braid and Tape Spooling Machines, for power.

Measuring Machines

for Braids and Trimmings

Bisé Machines

Single or in frames

Gimp Machines.

Twisting Machines.

Calendering Machines.

Singeing Machines.

Braid Shearing Machines.

Reeling Machines.

Braid Lappers.

Half Automatic Soutache Lappers.

Stranding Machines for 90 ends.

Plaiting (Bisé) Machine

for heavy cords, with large carousel for 90 spools.

Yard Meters for Braiding Machines.

Driving Tables.

Driving Gears.

Tables for Machines driven by belts.

Gears and Gear Cutting of every kind.

Special Machinery designed and built.

Patterns and Experimental Work.

Wrenches.

Special Screws.

Packing Braiders

WITH 4½ IN. GEARS.

Bobbins 2⅜ in. diam. and 5½ in. traverse.

12	Carrier	Round	Braider
16	"	"	"
20	"	"	"
24	"	"	"
28	"	"	"
32	"	"	"
36	"	"	"
40	"	"	"
48	"	"	"
72	"	"	"

Square Packing Braiders

WITH 8 HEAVY CARRIERS.

with	6	inch	gears,	Bobbins	2½ x 6 in.
"	9	"	"	"	4 x 6 in.
"	12	"	"	"	5 x 8 in.
"	16	"	"	"	6 x 9 in.

Braiding Machines for covering Electrical Wires

WITH 3 IN. GEARS, Carriers taking Bobbins 1⅜ x 4½ in.

SINGLE, 12, 16, 20, 24, 28, 32, 40, 48 and 72 Carriers.

DOUBLE DECK, 12 and 16 Carriers
16 and 16 "
16 and 24 "
24 and 24 "
24 and 36 "

TRIPLE DECK, 16, 20 and 24 Carriers
24, 28 and 32 "
28, 32 and 36 "

WITH 3½ IN. GEARS, Carriers taking Bobbins 1⅝ x 5½ in.
The same machines as above.

WITH 4½ IN. GEARS, Carriers taking Bobbins 2¼ x 5½ in.

SINGLE, 16, 20, 24, 32, 36 and 48 Carriers.

DOUBLE DECK, 12 and 16 Carriers
16 and 24 "
24 and 24 "
24 and 32 "
24 and 36 "

TRIPLE DECK, 12, 16 and 20 Carriers
16, 20 and 24 "
16, 24 and 24 "
24, 28 and 36 "
28, 32 and 36 "

WITH 6 IN. GEARS (extra heavy)
Carriers taking bobbins 3 x 6 in.

SINGLE, 16, 20, 24, 28, 32, 36 and 48 Carriers.

DOUBLE DECK, 16 and 24 Carriers
20 and 24 "
24 and 36 "

TRIPLE DECK, 16-20 and 24 Carriers

WITH 9 IN. GEARS, CABLE COVERING MACHINES.
Carriers taking Bobbins 4½ x 8½ in.

SINGLE, 24, 32 and 36 Carriers.

DOUBLE DECK, 16 and 24 Carriers
20 and 24 "
24 and 32 "

Electric Wire Covering Machines.

(*Continued.*)

Winding Machines

with 8 Carriers on platform.

SINGLE, DOUBLE AND TRIPLE DECK.

Spooling and Doubling Machines.

Flat Steel Wire Armor Covering Machines

with 10, 12, 14, 16, 20, 22 and 24 Carriers.

Telephone Cord Machines.

Twisting Machines.

Supplies.

CARRIERS, 11 sizes and styles.

TENSION WEIGHTS, lead with steel eye, from ¼ to 8 oz.
The same with china eyes for Silk Braids.
Iron ension weights from ½ oz. to 12 lbs.

SPOOLS AND BOBBINS of all styles and sizes. Regular sizes kept on hand.

TOP WEIGHTS for Carriers with outside weights.

ADJUSTABLE BOBBIN HOLDERS.

BRAID FORMERS, all sizes.

CHINA EYES, best German make.

BRAID CANS, made from hard fibre, light and very strong.

REELS OR DRUMS, made with wooden core and paper-mache flanges.

SWIFTS FOR WINDERS.

CHANGE GEARS, from 14 to 49 teeth.

CLUTCH GEARS, " 14 " 26 "

In addition to the machines and articles enumerated in the foregoing list we manufacture the following: Drilling and Tapping Machines for drilling holes and tapping them in one chucking, Self-centreing Vises for drill presses, Advertising Novelties, Cigar Cutters, Paper Spool Heads and Spools, etc.

We have the agency for the following German machines: Knitting Machines for all classes of trimmings, Sander & Graff, makers; Full Fashion Hosiery Machines, cotton system; Tape Polishing Machines, Yarn Stretching Machines and Strip Glueing Machines.

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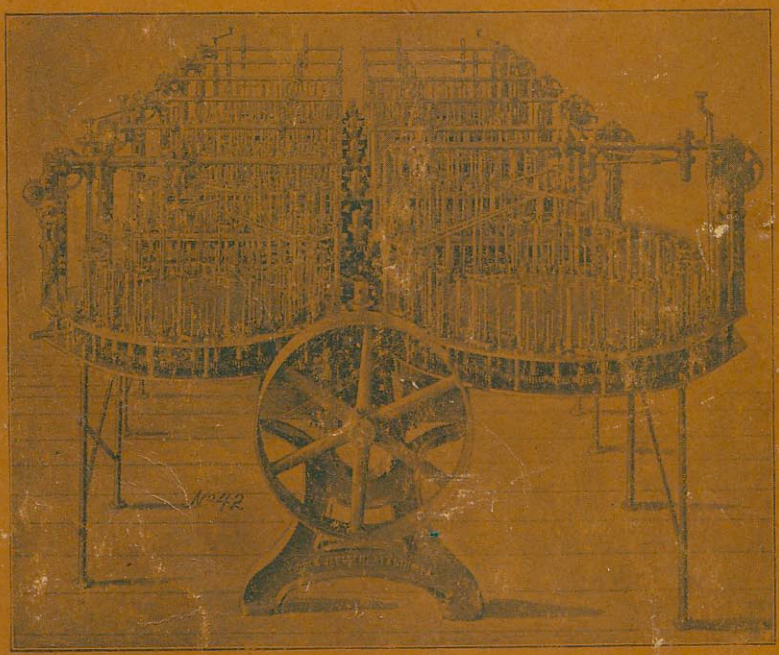
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